# INTERNATIONAL SAFETY MANAGEMENT

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- Introduction
- Management Systems
- The ISM Code
- Implementation of ISM requirements
- Synergies with other management disciplines
- Certification and enforcement

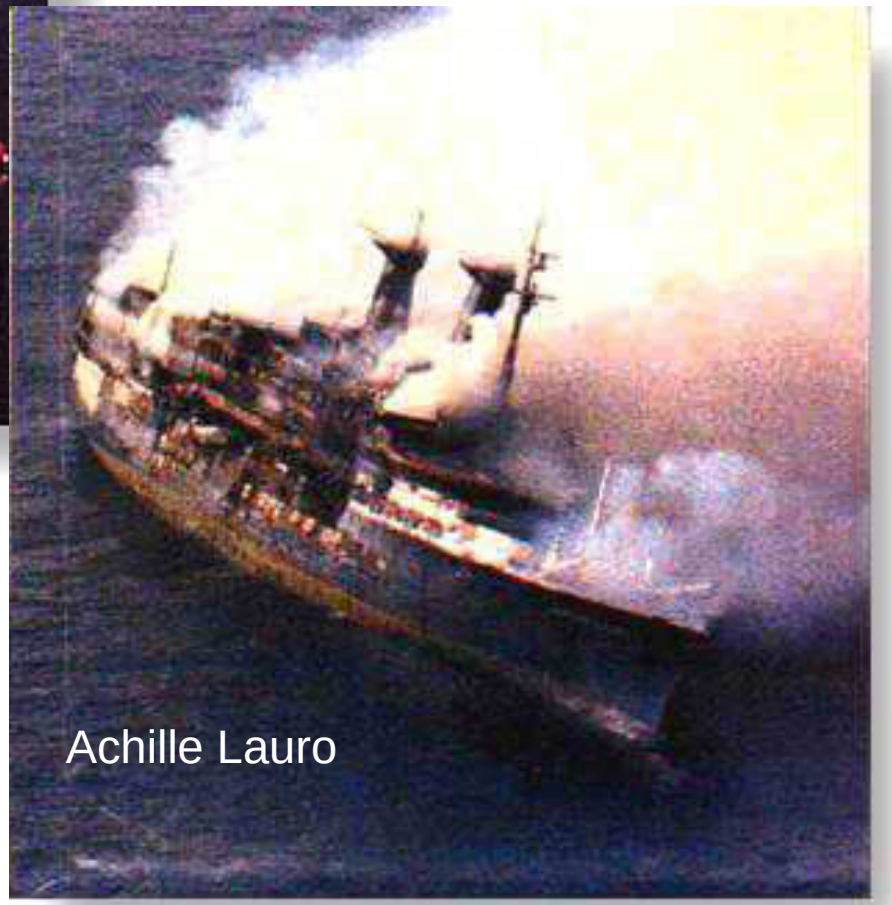

Introduction
Louis Vest

# Why does ISM exist?

Herald of Free Enterprise, 1987

# Maritime Catastrophes


# Fire and Collisions


# Tanker Accidents

Amoco Cadiz


Castelle Bellevue

# Environmental Disasters


# What is safety?

**Safety is...**

**... the likelihood**

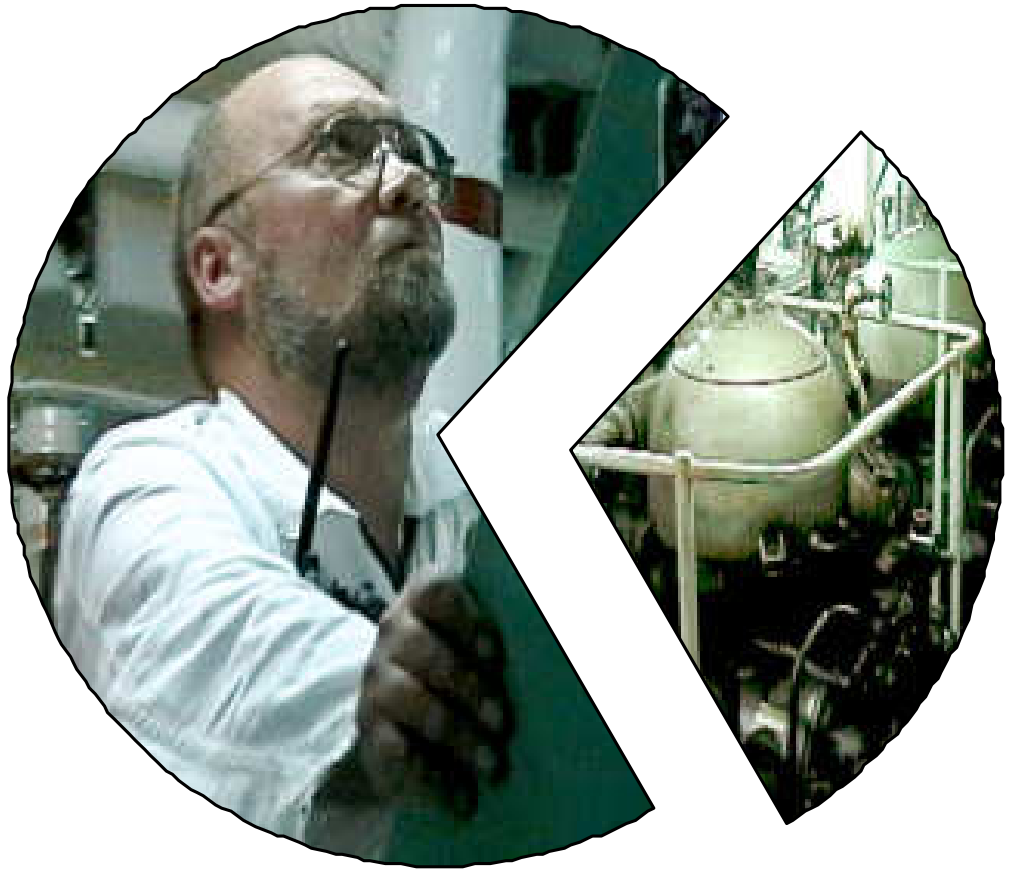
**that no accident or damage occurs.**

# Problems of the maritime industry

- Overtonnage
- Aggressive competition
- Economic pressure
- Reduction of crew
- Crewing by third party companies (crewing managers)
- Decreasing qualification
- Jounger officers with less experience
- Time pressure by tight schedules/charters
- Increasing shipboard administration

# Causes of accidents

human



machinery

# Strategy

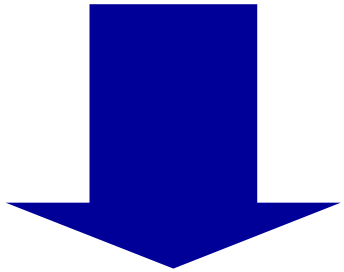
**Improvement of the Maritime Safety**

**by**

- Reduction of human errors
- Prevention from human errors
- A better organization of operations
- More transparency and clearness
- Promotion of the safety awareness
- Creating appropriate working conditions

**Systematic management**

**off all surrounding conditions**
**for safe work**



# Safety Management System

# Development of management systems

## Quality management

- 2. World war: first standardized management for US defence industry
- UK developed the standard BS 5750 for defence industry
- 1980s: supported introduction in British civil industry
- 1987 conversion to ISO 9000 ff.
- 1988 Group of Five interprets ISO 9002 for shipping companies
- 1990 Code of the Group of Five
- 1991 converted to ISMA-Code

## Safety Management

- 1987: Herald of Free Enterprise
  IMO developed resolutions
- 1989: Resolution A 647 (16)
- 1991: Resolution A 680 (17)
- 1993: Resolution A 741 (18)
  ISM-Code
- 1994: SOLAS IX

# IMO Resolutions

- A.647 (16) Guidelines on Management for the Safe Operation of Ships and for Pollution Prevention 19.10.1989
- A.680 (17) Update 06.11.1991
- A.741 (18) International Management Code for the Safe Operation of Ships and Pollution Prevention (ISM-Code) 04.11.1993

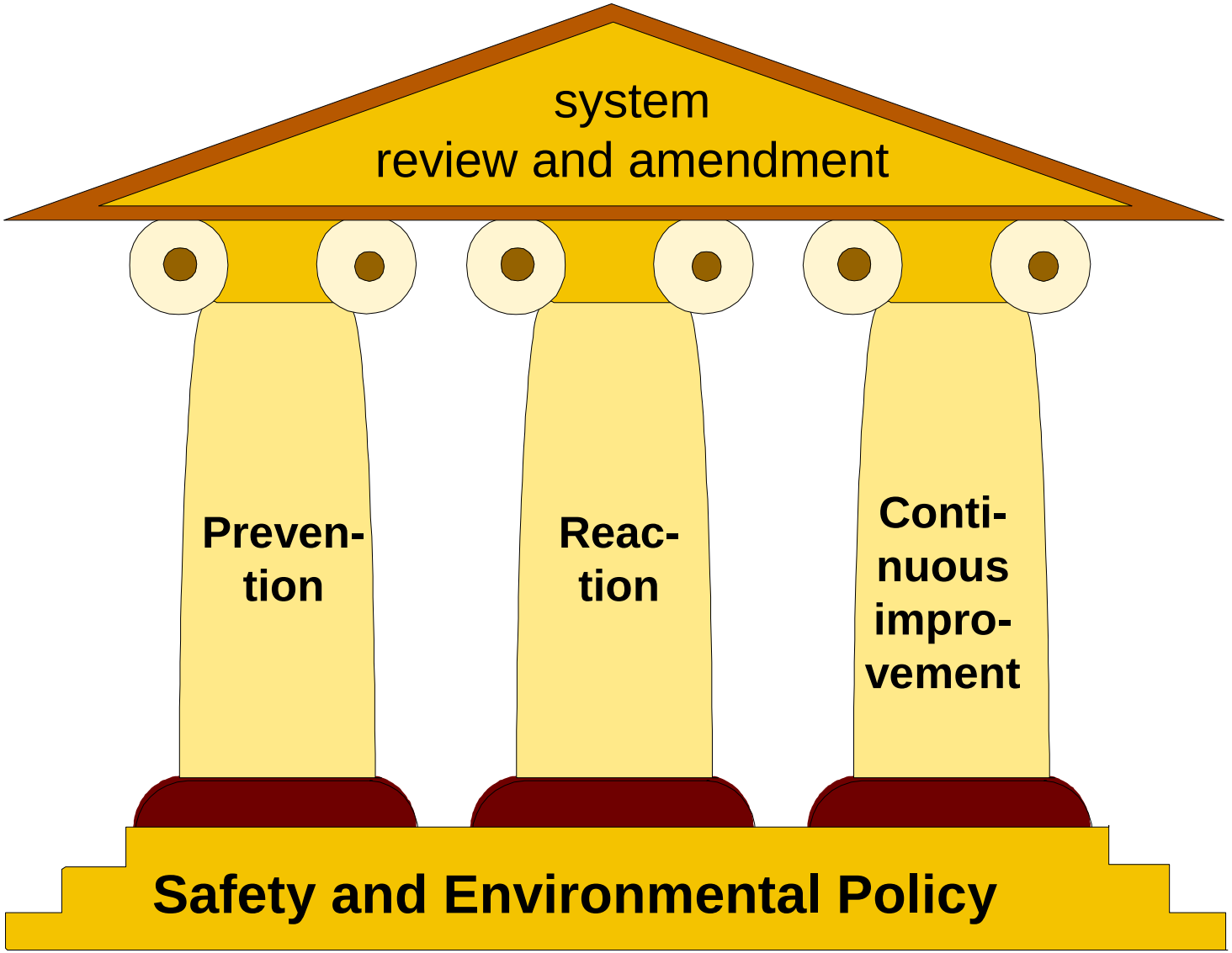
# Development of the ISM Code

- Development of an international regulation by the IMO
- Idea: Improvement of the safety by a management system
- establishing requirements in the ISM code
- Expansion of SOLAS by the chapter IX
- Ratification by the Flag states
- Conversion to national legislation by the flag States
- Certification by the Flag State
- Verification by the Port States

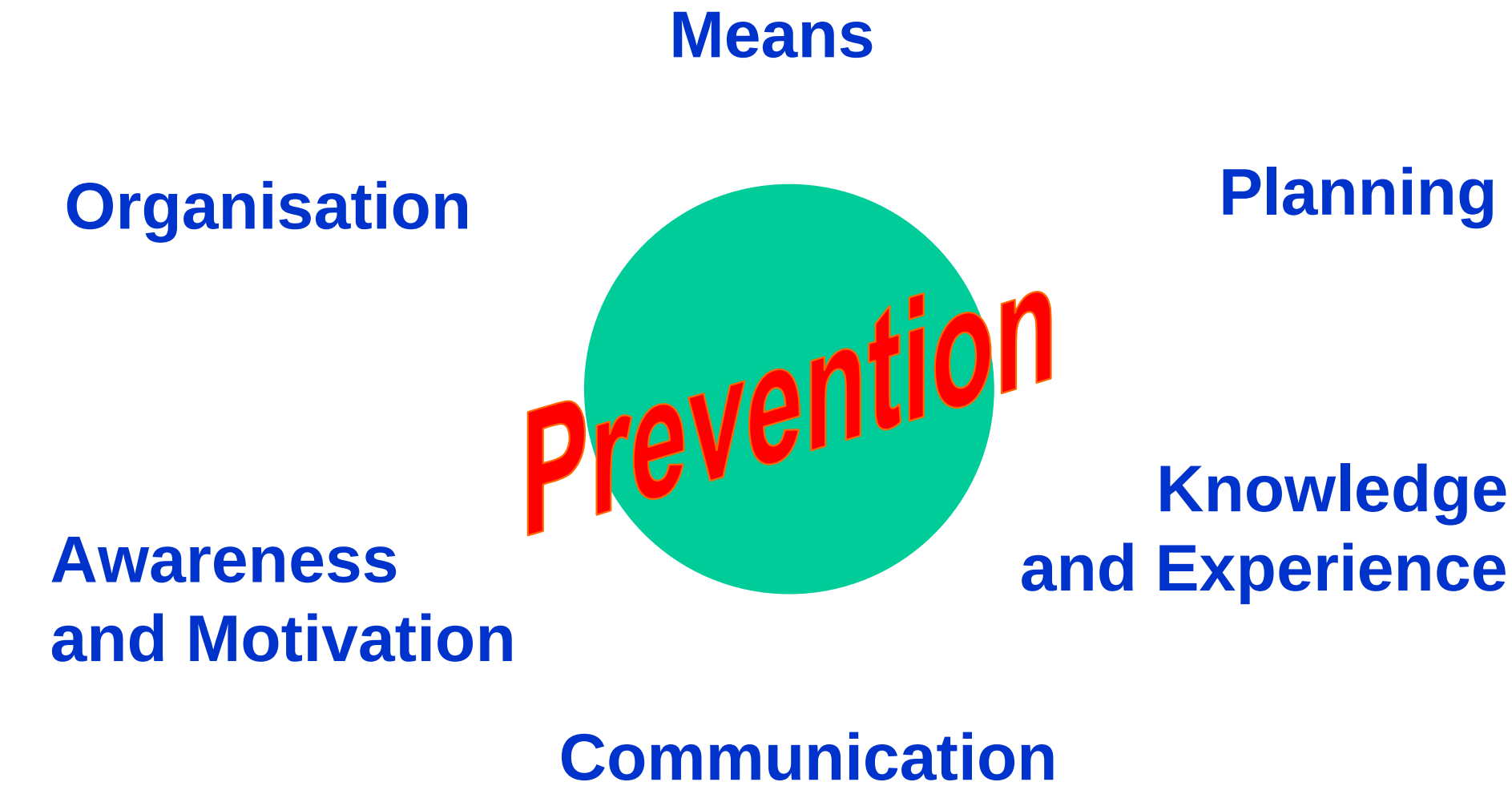
# Principles of ISM

- Individual arrangement by the shipping company
- Support of personal responsibility
- Self control and review
- Continual improvement
- External supervision of the system
- Confirmation by certificates

# Elements of ISM



# Prevention

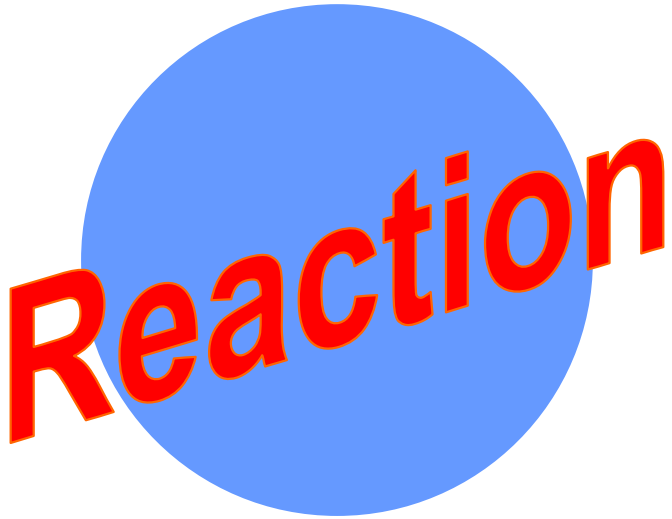

Means
Organisation
Planning
Prevention
Knowledge
and Experience
Awareness
and Motivation
Communication

# Reaction

reporting of deficiencies

Vigilance

learning from mistakes

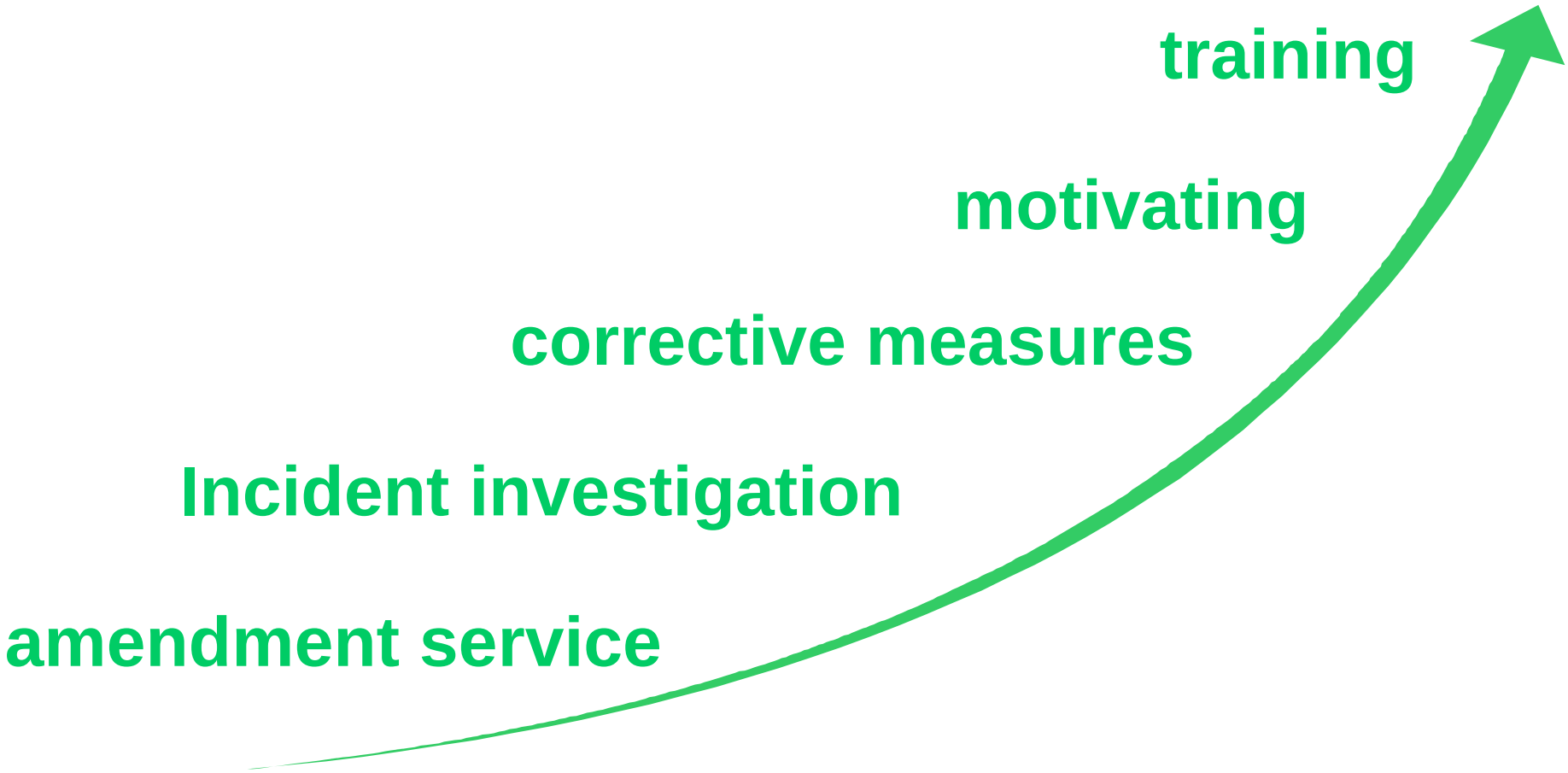



Handling of mistakes

right immediate actions

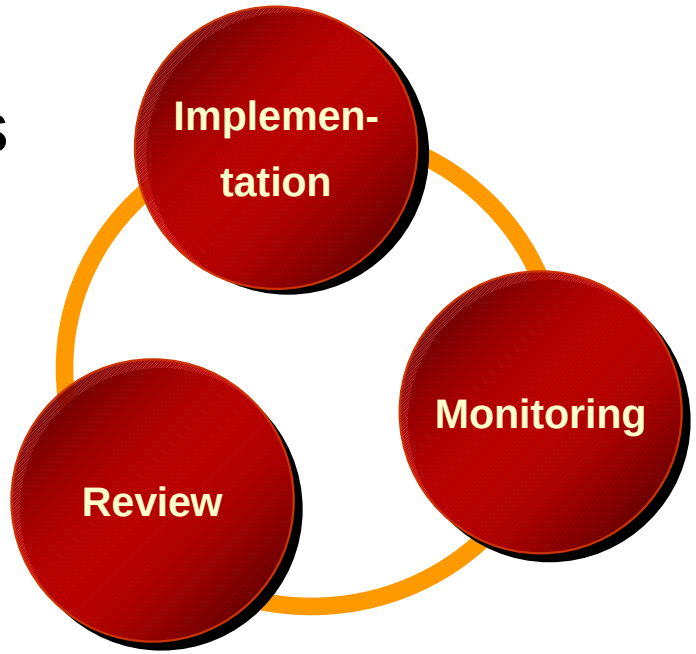
emergency management

# Continuous Improvement



# System Review and amendment

- Compliance monitoring by the Master
- Regular Reporting of the company
- Regular monitoring by the Designated person
- internal audits on board and ashore
- Review by the Master
- Review of the entire system
- establishing of corrective measures



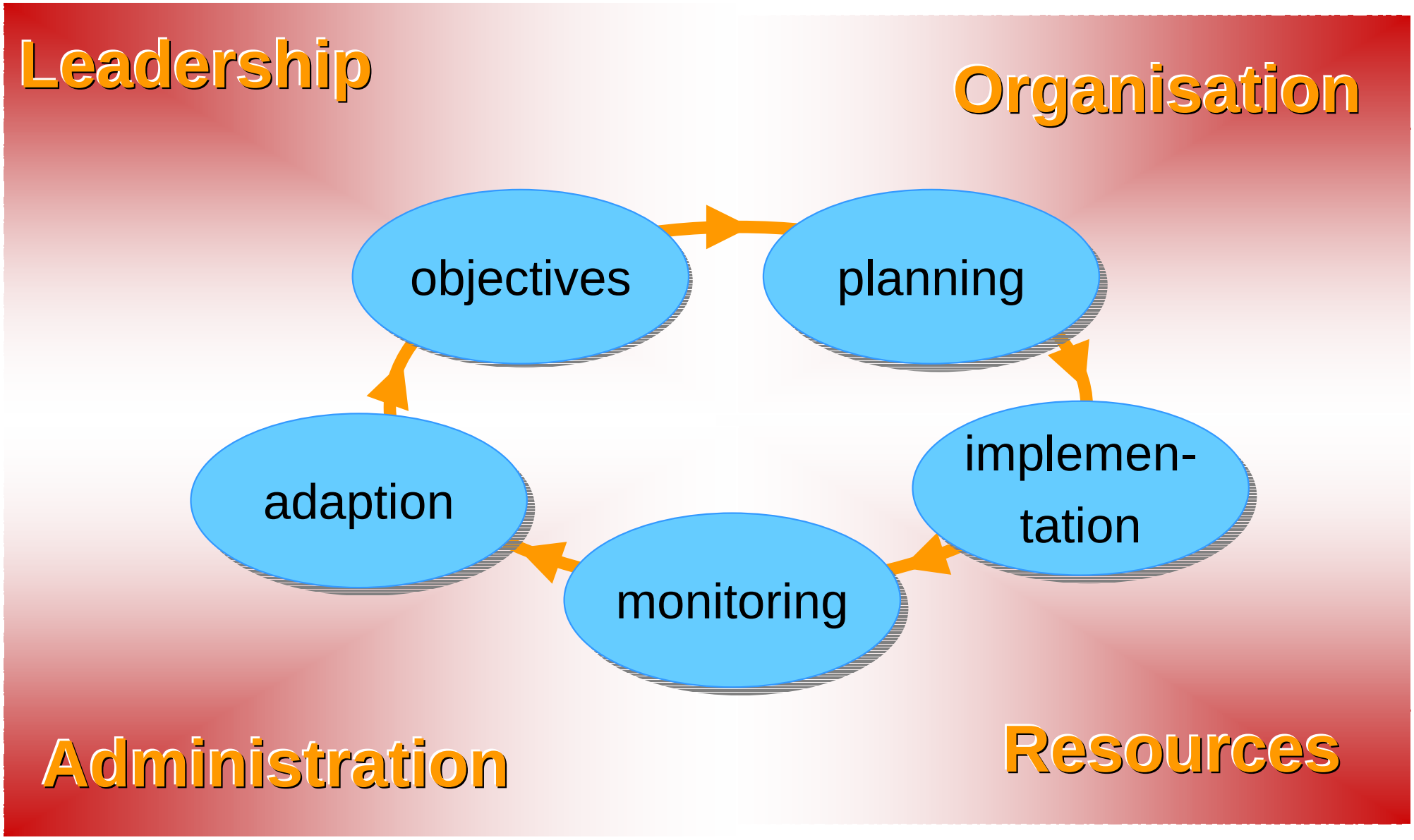

Management
Systems
Louis Vest

# Managementsystem

**A management system is the conceptual interaction of methods supporting an orgaization**

- to identify, establish and achieve necessary **objectives and targets**
- to **organize** their implemantation
- to **monitor** their effectiveness
- to **control** their implementation
- To monitor the **achievement of objectives**
- to take necessary **actions**

# Elements of management systems



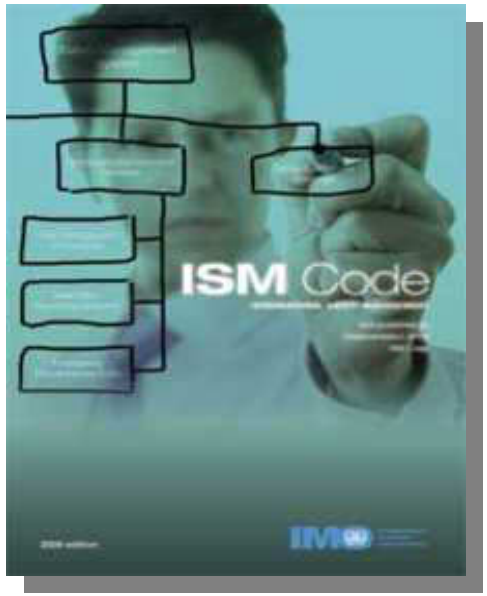

The
ISM Code
Louis Vest

# The structure of the ISM Code

**Preamble**

**Part A - Implementation**

**Part B – Certification and Verification**



# Part A - Implementation

1 General

2 Safety and environmental protection policy

3 Company responsibilities and authority

4 Designated Person

5 The Master

6 Resources and personnel

7 shipboard operations

8 Emergency preparedness

10 Maintenance of the ship

9 Non-conformities, accidents

11 Documentation

12 Company verification, review and evaluation

# Part B – Certification and verification

13 Certification and periodical verification

14 Interim certification

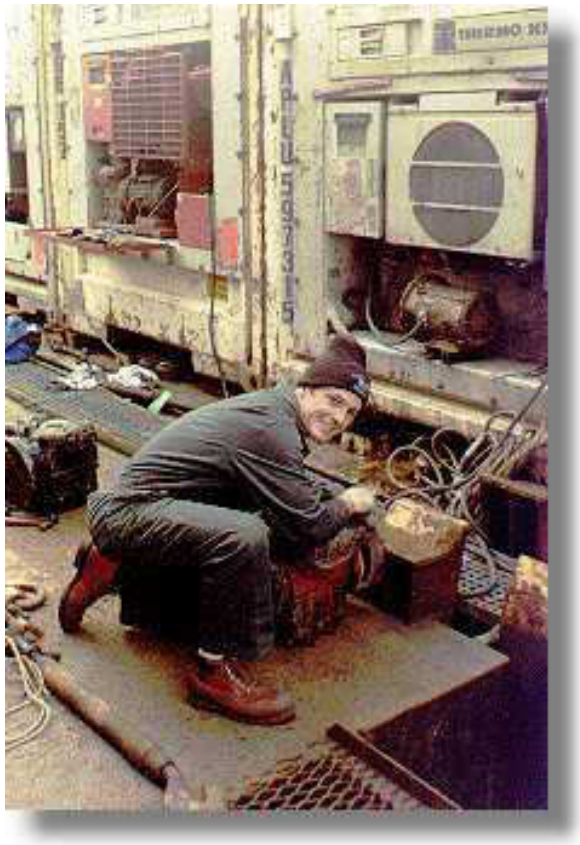
15 Verification

16 Forms of certificates

# What are the causes of errors and accidents?

# Human Factor

- Deficient education
- Deficient experience
- Deficient communication and vocational problems
- Cultural differences
- Frequent crew change, fluctuation
- Deficient support from shore
- Fatigue and overwork
- Deficient flexibility
- Deficient awareness
- Bad maintenance
- Excessive demands by new technology
- Excessive demands by too many legal requirements



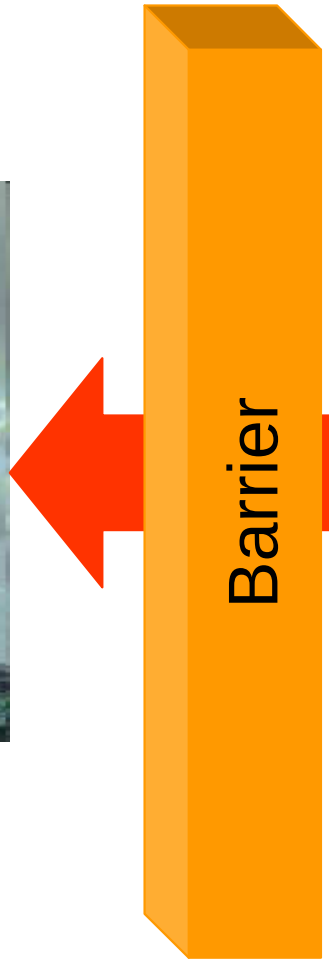
# How to prevent accidents?

Risk

Vessel

Hazard

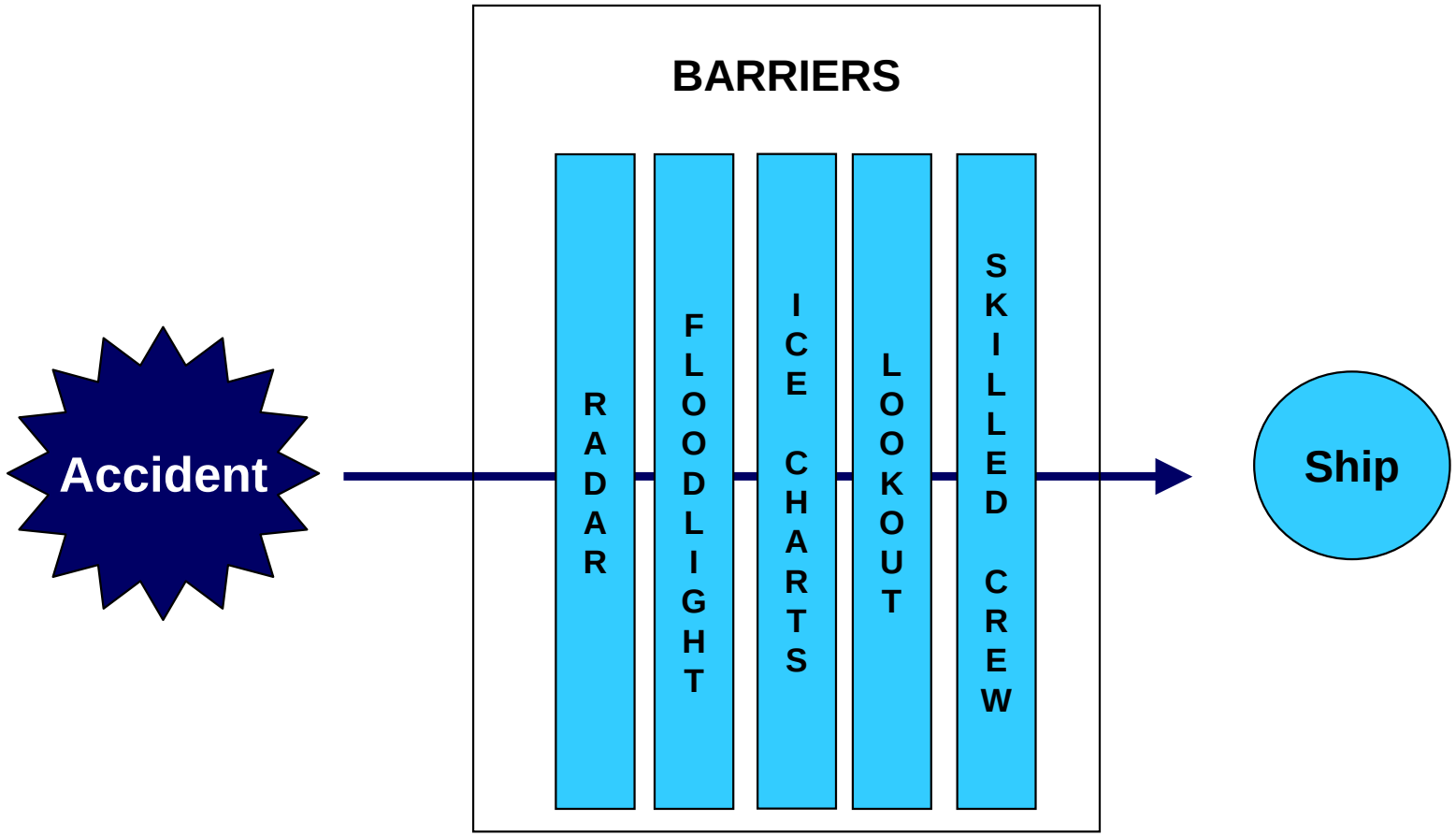
# How to prevent accidents?




Vessel

Hazard

# Concept of safety barriers (controls)



# Identification of risks

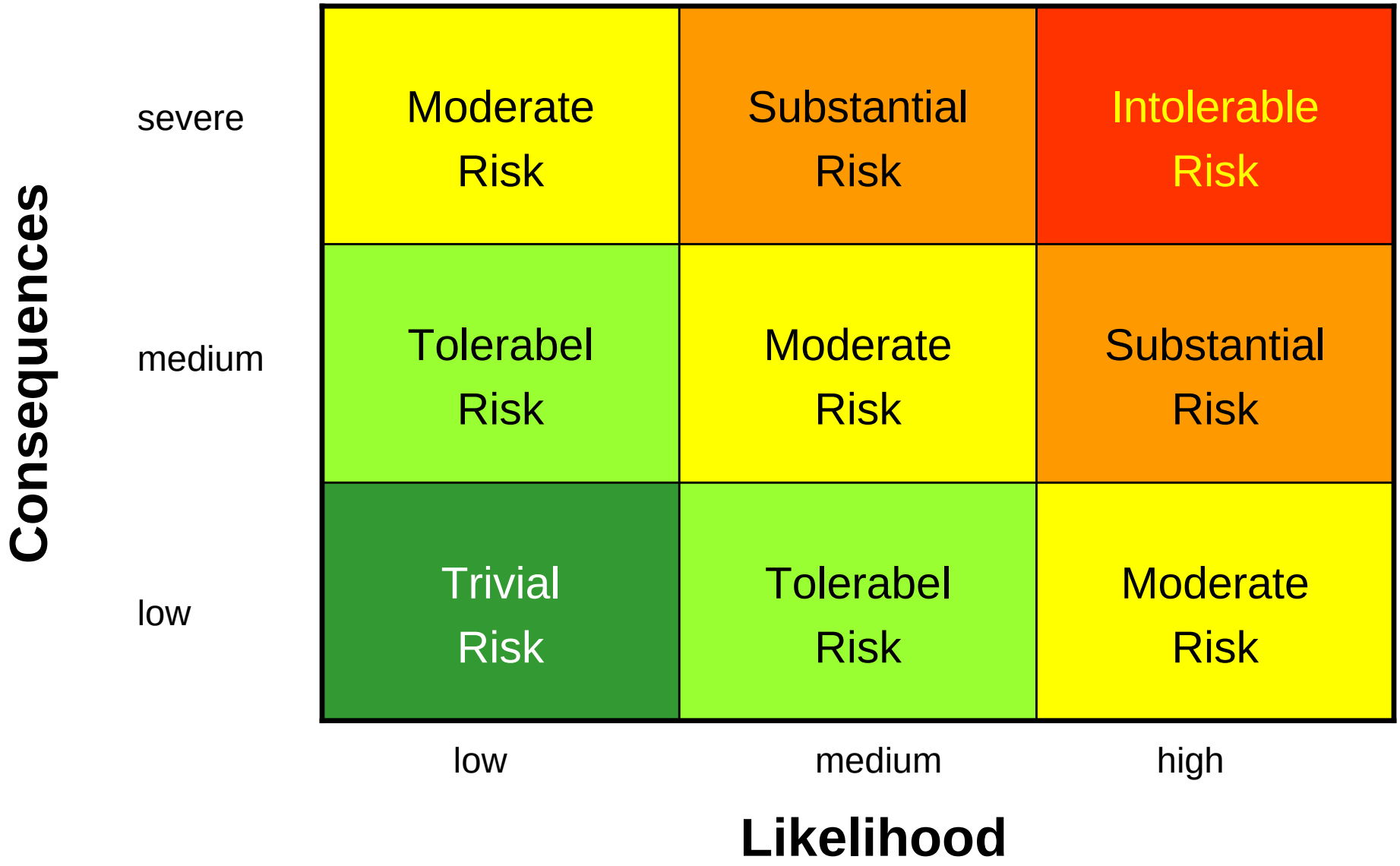
**1.2.2** Safety management objectives of the Company should, *inter alia:*

**.1** provide for safe practices in ship operation and a safe working environment;

**.2** assess all identified risks to its ships, personnel and the environment and establish appropriate safeguards; and

**.3** continuously improve safety management skills of personnel ashore and aboard ships, including preparing for emergencies related both to safety and environmental protection.

# Risk Assessment



# Risk Management

1. Hazard Identification
2. Risk Determination
3. Risk Assessment
4. Evaluation of existing controls
5. Improvement of controls

Re-Assessment of risk

# How would you assess the risk?
# Which barriers should be provided?

A sixteen year old cadet goes night watch with the Chief mate. The vessel rolls in heavy seas and rainy weather.

Suddenly the top navigation light failed. The officer sends the cadet to the top of the mast to exchange the bulb.

The cadet grips the bulb between his teeth and, sandalled with flip flops, climbs aloft.


Implementation of
ISM Requirements
Louis Vest

# Preamble

## Objectives

- international harmonized standard for maritime safety
- Safe management and safe shipboard operations
- Prevention from marine pollution

## Responsibilities of the Master

Resolution A 443 (XI)

## Reference to previous Resolutions

## Individual application of the Code

## Cornerstones of an effective manageement system

- Commitment from the top management
- Engagement of managers
- Knowledge and skills, awareness and motivation
- Engagement of people at all levels

# Preamble

1. The purpose of this Code is to provide an international standard for the safe management and operation of ships and for pollution prevention.

2. The Assembly adopted resolution A.443(XI) by which it invited all Governments to take the necessary steps to safeguard the shipmaster in the proper discharge of his responsibilities with regard to maritime safety and the protection of the marine environment.

3. The Assembly also adopted resolution A.680( 17) by which it further recognized the need for appropriate organization of management to enable it to respond to the need of those on board ships to achieve and maintain high standards of safety and environmental protection.

4. Recognizing that no two shipping companies or shipowners are the same, and that ships operate under a wide range of different conditions, the Code is based on general principles and objectives.

5. The Code is expressed in broad terms so that it can have a widespread application. Clearly, different levels of management, whether shore-based or at sea, will require varying levels of knowledge and awareness of the items outlined.

6. The cornerstone of good safety management is commitment from the top. In matters of safety and pollution prevention it is the commitment, competence, attitudes and motivation of individuals at all levels that determines the end result.

## General

- Terms and definitions
- Objectives
- Application
- Functional requirements

# Definitions

**1.1 DEFINITIONS**

**1.1.1** "International Safety Management (ISM) Code" means the International Management Code for the Safe Operation of Ships and for Pollution Prevention as adopted by the Assembly, as may be amended by the Organization.

**1.1.2** "Company" means the Owner of the ship or any other organization or person such as the Manager, or the Bareboat Charterer, who has assumed the responsibility for operation of the ship from the Shipowner and who on assuming such responsibility has agreed to take over all the duties and responsibility imposed by the Code.

**1.1.3** "Administration" means the Government of the State whose flag the ship is entitled to fly.

# Objectives

**1.2 OBJECTIVES**

**1.2.1** The objectives of the Code are to ensure safety at sea,
prevention of human injury or loss of life, and
avoidance of damage to the environment, in particular, to the marine environment, and to property.

# Objectives

**1.2.2** Safety management objectives of the Company should, inter alia:

**.1** provide for safe practices in ship operation and a safe working environment;

**.2** assess all identified risks to its ships, personnel and the environment and establish appropriate safeguards; and

**.3** continuously improve safety management skills of personnel ashore and aboard ships, including preparing for emergencies related both to safety and environmental protection.

# Compliance

**1.2.3** The safety management system should ensure:

**.1** compliance with mandatory rules and regulations; and

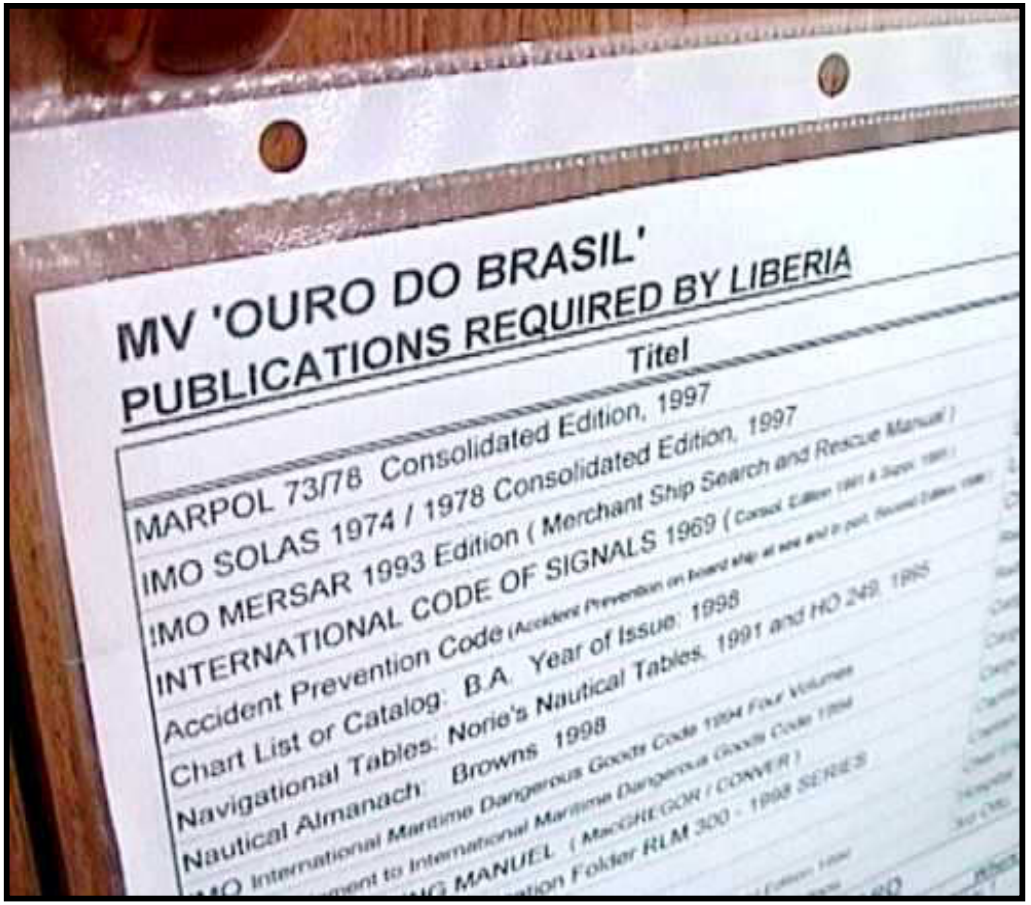
**.2** that applicable codes, guidelines and standards recommended by the Organization, Administrations, classification societies and maritime industry organizations are taken into account.

# Legal compliance

- Identification of applicable rules and regulations
- Access to current versions of rules and regulations
- Analysis of application, i.e. departments, processes
- Preparation of instructions
- Monitoring of operations
- Records as objective evidence of compliance
- Evaluation of legal compliance

# Administration of legal requirements

- List of all applicable rules and regulations
- Update service
- Regular visit of IMO/ILO websites
- Distribution list
- Electronical access
- Internal amendment service



# Application

**1.3 APPLICATION**

The requirements of this Code may be applied to all ships.

# Functional requirements

## 1.4 FUNCTIONAL REQUIREMENTS FOR A SAFETY MANAGEMENT SYSTEM (SMS)

Every Company should develop, implement and maintain a Safety Management System (SMS) which includes the following functional requirements:

**...**

# Functional requirements

.1 a safety and environmental protection **policy**;

.2 **instructions and procedures** to ensure safe operation of ships and protection of the environment in compliance with relevant international and flag State legislation;

.3 defined levels of **authority** and **lines of communication** between, and amongst, shore and shipboard personnel;

.4 procedures for **reporting accidents** and non-conformities with the provisions of this Code;

.5 procedures to prepare for and respond to **emergency situations**; and

.6 procedures for **internal audits and management reviews**.

## Policy

- to be established
  - Describing how the objectives should be achieved
- to be implemented and maintained
  - On all levels of the organization
  - Ashore and on board

# Policy

**2 SAFETY AND ENVIRONMENTAL PROTECTION POLICY**

**2.1** The Company should establish a safety and environmental protection policy which describes how the objectives, given in paragraph 1.2, will be achieved.

**2.2** The Company should ensure that the policy is implemented and maintained at all levels of the organization, both ship-based as well as shore-based.

- Commitment of the top management
- Importance of safety and environmental protection
- Unique orientation to all employees and crews
- Clear and easy to understand objectives
- Practicable guidance for daily operations

## Company responsibilities and authority

- The company
  - Establishing and reporting of the entity responsible for ship operation
- Definition of
  - responsibilities
  - authority
  - interrelation
- Support for the Designated Person
  - resources
  - shorebased support

# Clear Responsibility

**3 COMPANY RESPONSIBILITIES AND AUTHORITY**

**3.1** If the entity who is responsible for the operation of the ship is other than the owner, the owner must report the full name and details of such entity to the Administration.

☑ ashore
☐ on board

- The registered shipowner is responsible
- Reporting to flag State Authorities the name of a third party ship manager

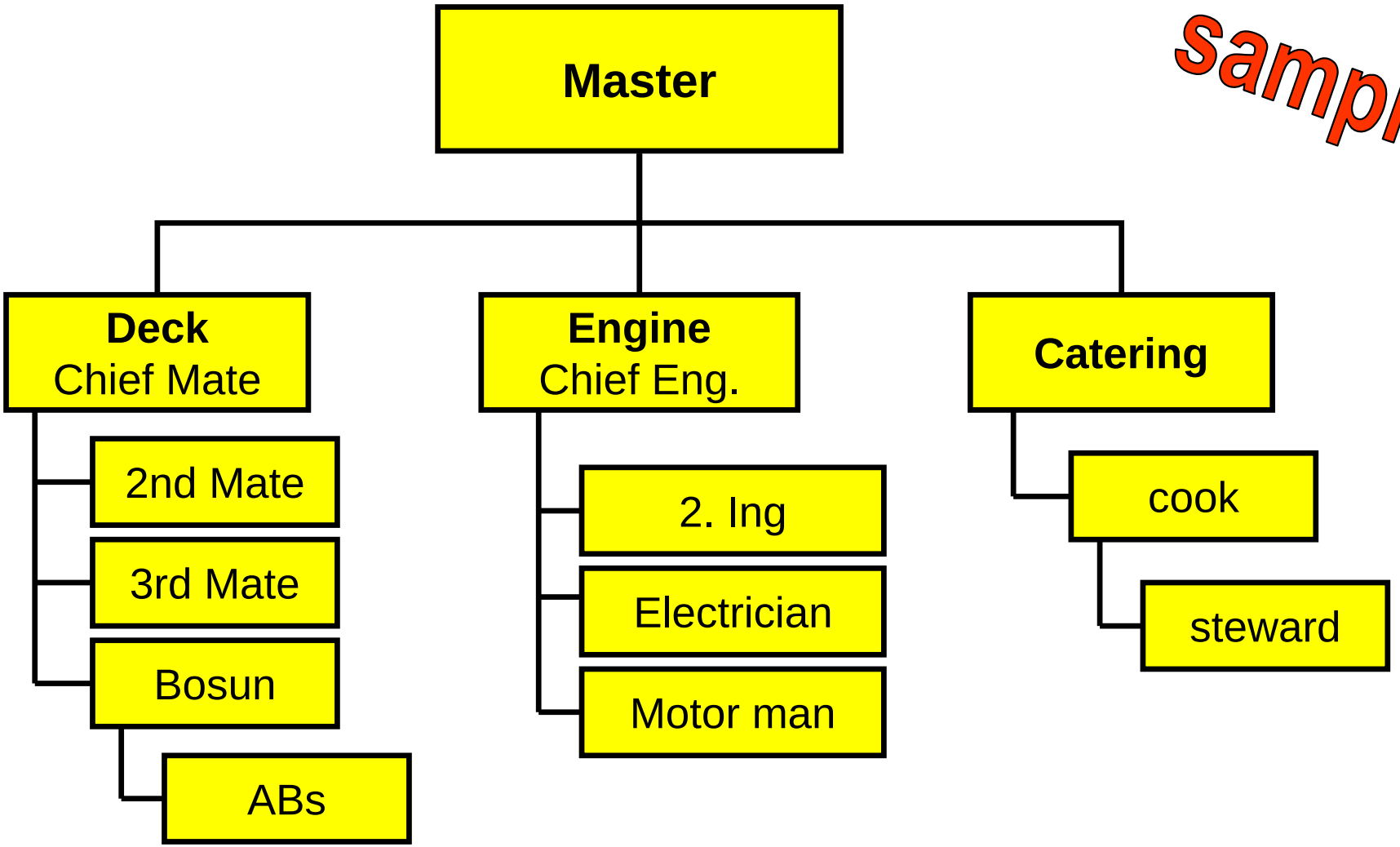
# Organization

**3.2** The Company should define and document the responsibility, authority and interrelation of all personnel who manage, perform and verify work relating to and affecting safety and pollution prevention.

☑ ashore
☑ on board

- Establishing of the organizational structure:
- Clear definition of responsibilities
- Delegation of responsibilities
- Definition of structures, interfaces between functions
- Establishing of authority

# Organization chart (vessel)



# Function description

Sample

| | |
|---|---|
| **Number:** | JD 03 |
| **Function:** | Cargo officer |
| **Department:** | Deck |
| **Responsibilities:** | • Planning, supervision, control of cargo operations<br>• Calculation and monitoring of stability, trim, strength<br>• Ballast operations<br>• Planning and supervision of dangerour goods<br>• Administration of cargo documents |
| **Authority:** | • Instructions to bosun and deck crew<br>• Instructions to other deck officers for watch<br>• Instructions to engine department for ballast operationsn after consultation with chief mate only |
| **Qualification:** | • STCW license<br>• HazMat Certificate<br>• Knowledge of the trade area (incl. Spanish language) |

# Resources and support

**3.3** The Company is responsible for ensuring that adequate resources and shore-based support are provided to enable the designated person or persons to carry out their functions.

☑ ashore
☐ on board

- Providing the necessary framework for safety
  - finances
  - infrastructure
  - personell resources

## Designated Person Ashore (DPA)

- Organisation
  - One or several persons
  - Located ashore
  - Direct access to top management

- Responsibilities
  - Ensuring of safe ship operations
  - Direct link between ships‘ crews and office
  - Monitoring of ships‘ safety

- Authority
  - Resources and shorebased support

# Designated Person

## 4 DESIGNATED PERSON(S)

To ensure the safe operation of each ship and to provide a link between the Company and those on board, every Company, as appropriate, should designate a person or persons ashore having direct access to the highest level of management.

The responsibility and authority of the designated person or persons should include monitoring the safety and pollution prevention aspects of the operation of each ship and to ensure that adequate resources and shore-based support are applied, as required.

☑ ashore
☐ on board

## The Master

- Responsibilities
  - Implementation of the policy
  - Motivating of the crew
  - Issuing orders
  - Monitoring of compliance
  - Review of the management system

- Authority
  - Clear definition of Master‘s autority
  - Overriding authority

# The Master

## 5 MASTER'S RESPONSIBILITY AND AUTHORITY

**5.1** The Company should clearly define and document the masters responsibility with regard to:

**.1** implementing the safety and environmental protection policy of the Company;

**.2** motivating the crew in the observation of that policy;

**.3** issuing appropriate orders and instructions in a clear and simple manner;

**.4** verifying that specified requirements are observed and

**.5** periodically reviewing the SMS and reporting its deficiencies to the shore-based management.

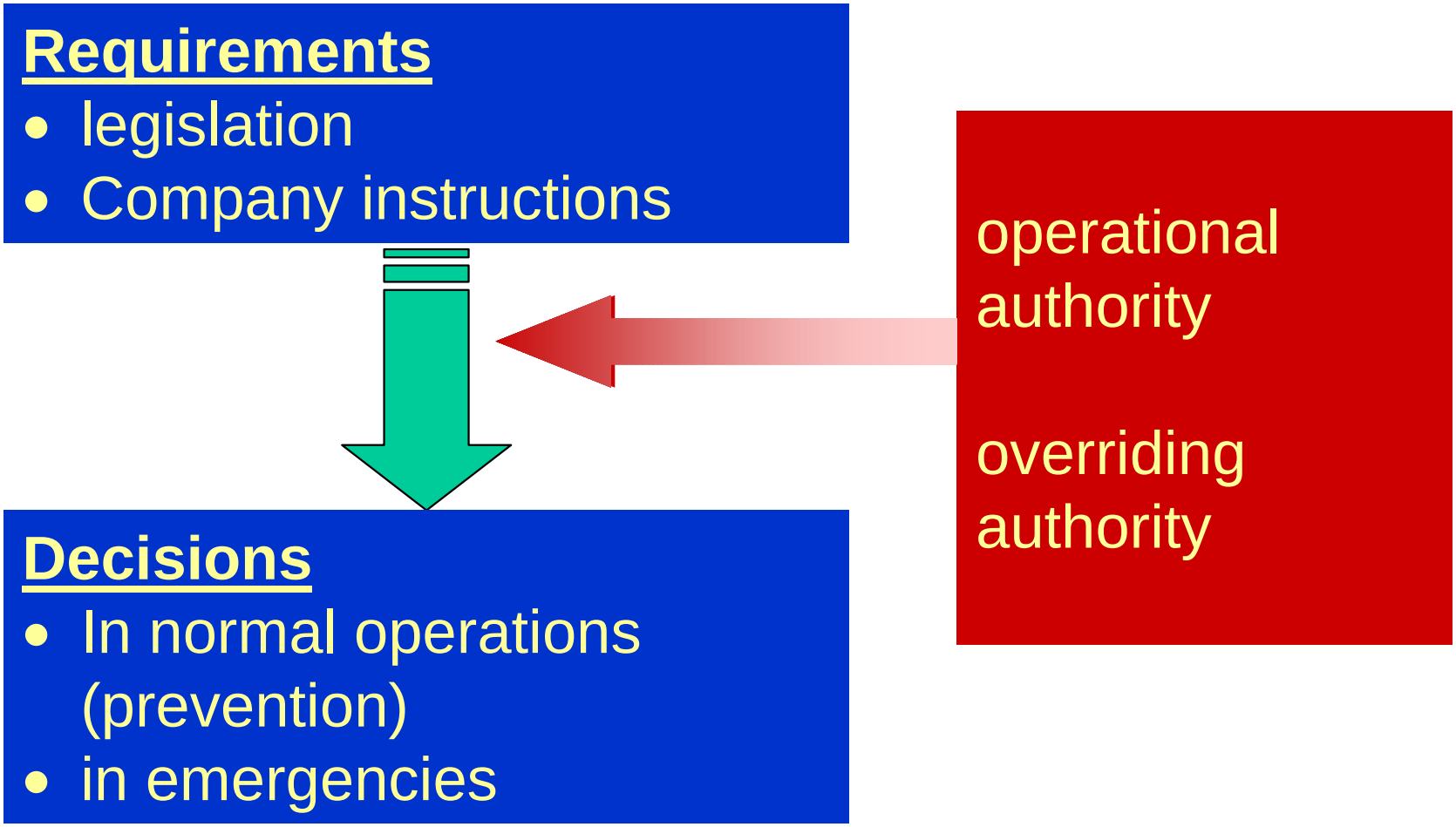
# Master‘s authority

**5.2** The Company should ensure that the SMS operating on board the ship contains a clear statement emphasizing the Master s authority.

The Company should establish in the SMS that the Master has the overriding authority and the responsibility to make decisions with respect to safety and pollution prevention and to request the Company's assistance as may be necessary.

- Documented authority of the Master
- Documented overriding Authority
- Authority to request assistance as necessary

# Obligation to act



## Personnel

- The Master
- Crew and qualification
- Familiarization of new crew
- Knowledge of legal requirements
- Training
- System knowledge and languages
- Communication

# The Master

**6 RESOURCES AND PERSONNEL**

**6.1** The Company should ensure that the master is:

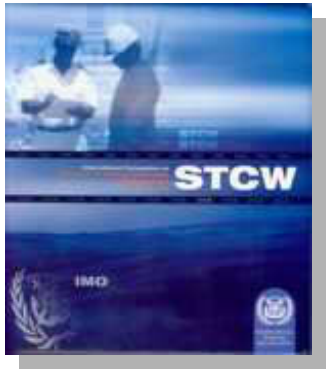
**.1** properly qualified for command;

**.2** fully conversant with the Company's SMS; and

**.3** given the necessary support so that the Master's duties can be safely performed.

# Requirements for the Master

- Qualified for command
  - licenses
  - experience
  - fitness




- Proper knowledge of the system
  - System familiarization
  - Visits in the company ashore

- Shorebased support
  - Communication
  - Reaction on request of assistance
  - Avauilablity of resources (e.g. crew, finance)

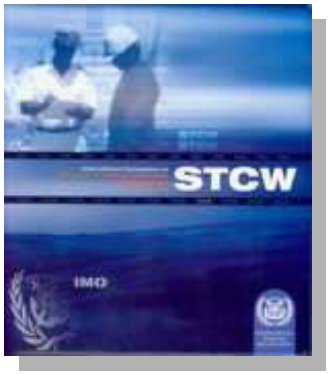
# 6.2 crew qualification

**6.2** The Company should ensure that each ship is manned with qualified, certificated and medically fit seafarers in accordance with national and international requirements.

☑ ashore
☑ on board

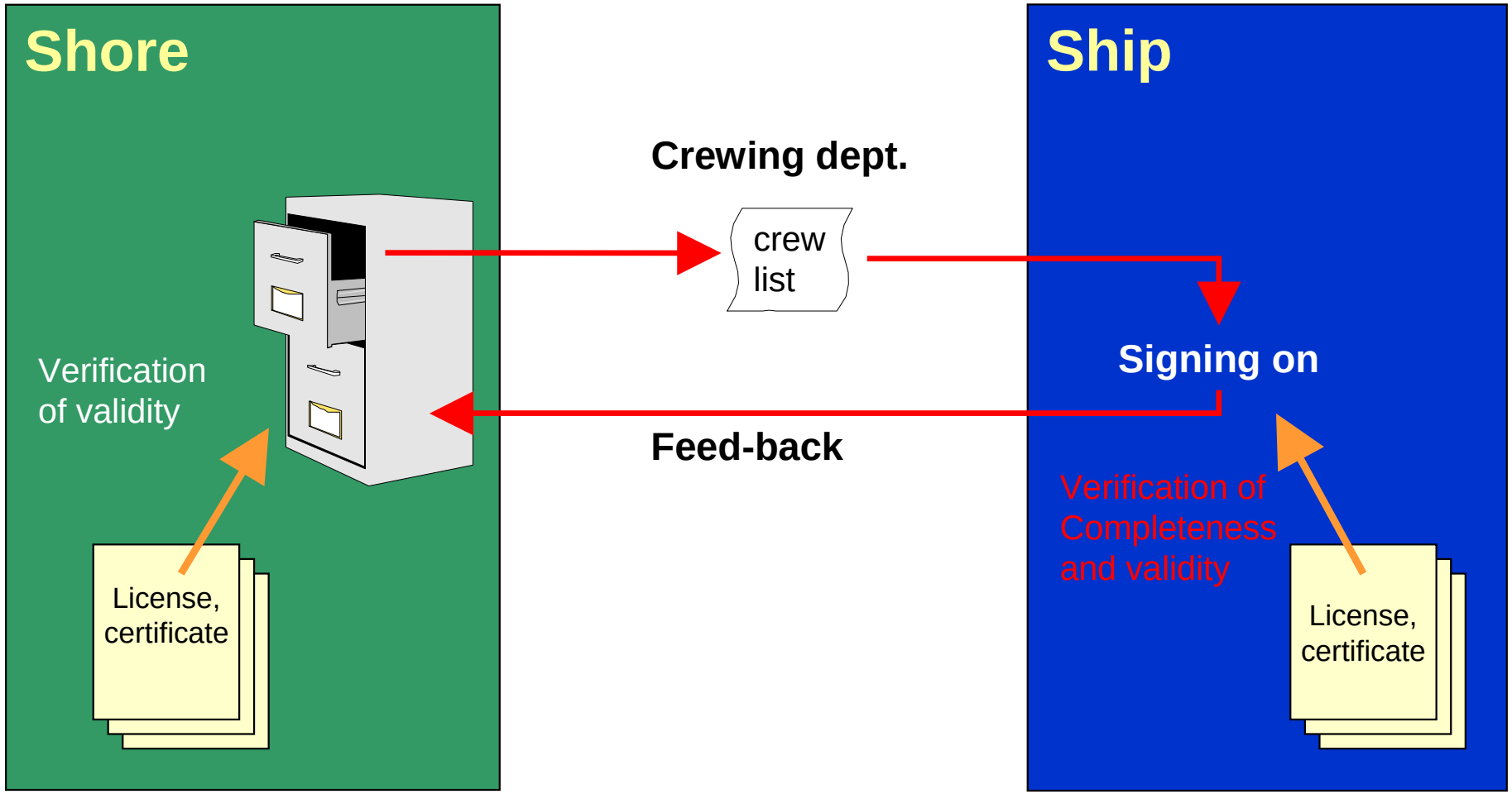
# Crew and qualification

- Ensure safe manning and qualification of the crew
  - Qualification
  - Licenses/records
  - Physical and mental fitness
  - According to STCW and flag State requirements




- Organise crewing of all vessels
- Identification and meeting STCW requirements
- Minimum safe manning
- Verification of licenses and qualifications

# Workflow for qualification check



# Familiarization

6.3 The Company should establish procedures to ensure that new personnel and personnel transferred to new assignments related to safety and protection of the environment are given proper familiarization with their duties. Instructions which are essential to be provided prior to sailing should be identified, documented and given.

☑ ashore
☑ on board

- Develop familiarization checklists for different types of crew
- Include local arrangements on board, procedures, particular risks, safety equipment and escape routes
- Conduct training before sailing
- Have signed recrds available

# Knowledge of legal requirements

**6.4** The Company should ensure that all personnel involved in the Company's SMS have an adequate understanding of relevant rules, regulations, codes and guidelines.

☑ ashore
☑ on board

# Knowledge of legal requirements

- The company shall ensure
  - knowledge of law, regulations and guidelines
  - Of all crew and staff envolved in the system
  - as appropriate

- Access to current versions of legislation
- Current up-dating of information
- Analizing of changes of requirements
- Information and training of staff and crew
- Have relevant legislation available on board and in the office

# How to provide legal knowledge

- Contents of documented procedures and instructions
- Signs, placards and posted warnings
- Company circulars, posted information
- Meetings
- Safety drills
- Videos and computer based training
- Discussions
- Incident analysis
- etc.

# Rest hours regulations

- According to STCW and MLC 2006
- Applicable for all seafarers

✓ **<u>Minimum rest hours</u>**
10 hrs. in any 24 h
10 hrs. rest divided into no more than two periods
One rest period minimum 6 hrs.
Interval between rest periods max. 14 hrs.
77 hrs. In any 7 day period

✓ Table of shipboard working arrangements posted on board
✓ Records of work or rest signed by Master and seafarer

# 6.5 Training

**6.5** The Company should establish and maintain procedures for identifying any training which may be required in support of the SMS and ensure that such training is provided for all personnel concerned.

☑ ashore
☑ on board

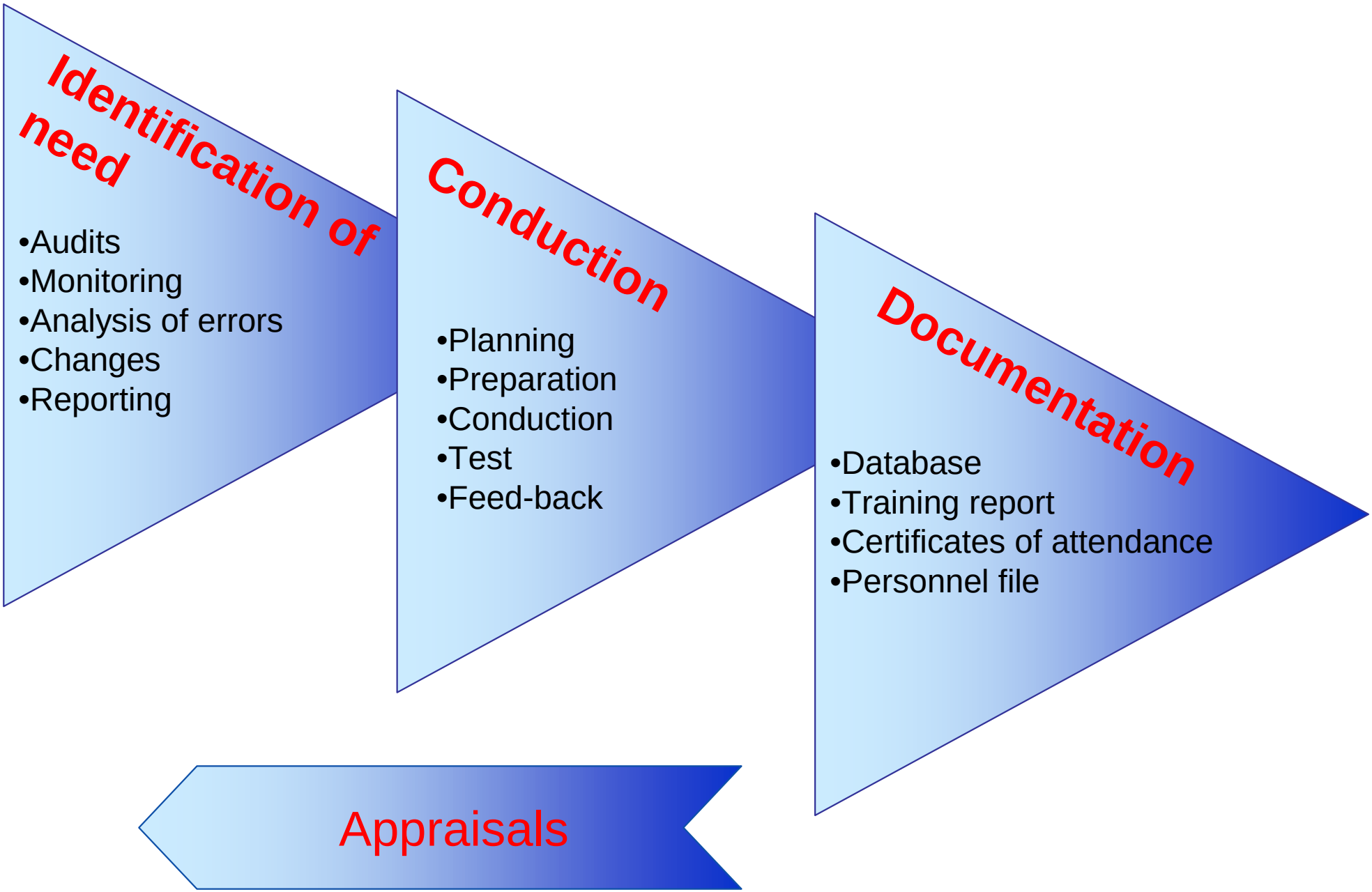
# Training

**Objectives of ISM:**
Continual improvement of skills of the crew

The human is in the focus!

Motivation - Awareness - Knowledge

# Organization of training



# Language and communication

**6.6** The Company should establish procedures by which the ship's personnel receive relevant information on the SMS in a working language or languages understood by them.

**6.7** The Company should ensure that the ship's personnel are able to communicate effectively in the execution of their duties related to the SMS.


☐ ashore
☑ on board

# Information on the SMS

- Inform about the system and all relevant contents
  - Policy
  - Own job description
  - Relevant procedures and instructions
  - Emergency plans
- in languages understood by the crew and staff

- Language of the Safety Management Manual
- Language of posted information
- Language of makers manuals
- Language of trainings and drills
- Language of signs and plates on board

# Vocational problems

How well can seafarers communicate with each other?

# Working language on board

- Ensure communication
  - On board with each other
  - Shipboard management with the company
  - Shipboard management with externals

- Errors often occur by misunderstanding
- No communication problems!
- No language mix!
- The shipboard management should be able to communicate with every seafarer directly

# Language on passenger vessels

SOLAS, Chap. V Regel 13c

- *One* working language shall be defined
- *Every* crew member can understand this language
- Establish this language in the ship‘s log book
- Working language means:
  - to understand intructions received
  - to reply and give feed-back
  - to instruct others as required

STCW 95, A-V/3 Reg. 3

- Service staff on board can communicate in main languages of passengers

## Shipboard operations

- Preparation of
  - Plans
  - Instructions
  - Checklists

- for key shipboard operations
- considering qualified crew

## 7 DEVELOPMENT OF PLANS FOR SHIPBOARD OPERATIONS

The Company should establish procedures, plans and instructions, including checklists as appropriate, for key shipboard operations concerning the safety of the personnel, ship and protection of the environment. The various tasks should be defined and assigned to qualified personnel.

☐ ashore
☑ on board

- Identification of processes
- Planning of processes
- Implementation, training
- Internal auditing of processes

# What are
# key shipboard operations?
# critical operations?
# other operations?

# Key shipboard operations

## Routine operations

- Watches (bridge and engine room)
- Loading and discharging
- Cargo securing
- Calculating of draft, trim, stability and stress of hull
- ISPS access control
- Updating of seacharts and nautical publications
- Maintenance
- Preparing for sea
- Gas freeing
- Tank cleaning
- Passage planning
- Garbage handling
- Bunkering

# Contents of a procedure

- Collect information
- Planning
- Preparation
- Conducting
  - Working steps
  - Monitoring and measurement
  - Process control
- Follow-up
- Recording
- Reporting

## Critical operations

- Navigating in confined waters or in high traffic density
- Handling of dangerous goods
- Navigating at reduced visibility
- Navigating in heavy weather
- Navigating in ice areas
- Bunkering and oil transfer at sea
- Cargo operations on gas, chemical and oil tankers
- Critical engine maneouvres

# Work Permit Procedure

## Procedure

- General regulations
- Responsibilities
- Briefing
- Preparation for work
- Checks and authorization
- Operational steps including
  - monitoring
  - assistance
- After work verification
- Clearing up
- Debriefing

**Checklists**

- Hot work
- Entry into enclosed spaces
- Working in confined spaces
- Working overboard
- Working aloft
- Working on running engines
- Working with high voltage
- Reconstructing the ship

## Emergencies

- Establish emergency plans
- Establish training and drills
- Organize shorebased support

# What emergencies may happen?

- At sea
- Cargo related
- Related to persons

# Emergencies

**General:**
- Fire
- Explosion
- Oil leakage
- Leakage of dangerous cargoes

**At sea:**
- Damages due to heavy weather
- Water ingress
- Collision
- Grounding, stranding
- Cargo shifting
- Loss of deck‘s cargo
- Main engine failure
- Stearing gear failure
- Electricity failure, black out
- Rescue of others

**In port:**
- Hull damage due to excessive stress while loading, discharging or ballasting
- Breaking of mooring lines

**Cargo related:**
- Warming up of liquid gas
- Freeing of poisonous or acid substances
- Freeing of radio activity

**Human related:**
- Failure of key personnel
- Person over board
- Severe injury
- Recovery of persons from enclosed spaces
- Stow aways
- Piracy

# ISM Element 8

**8 EMERGENCY PREPAREDNESS**

**8.1** The Company should identify potential emergency shipboard situations, and establish procedures to respond to them.

☐ ashore
☑ on board

# Drills and exercises

**8.2** The Company should establish programmes for drills and exercises to prepare for emergency actions.

☐ ashore
☑ on board

- Annual emergency drill plan
- Train for every emergency
- Conduct training according to emergency plan
- Include shorebased company
- Document the drills and exercices

# Emergency response center ashore

**8.3** The SMS should provide for measures ensuring that the Company's organization can respond at any time to hazards, accidents and emergency situations involving its ships.

☑ ashore
☐ on board

- Establish an emergency team ashore
- Organize standby cervice and alarm procedures
- Make available documentation and data of vessels, cargoes, crews and external experts
- Conduct common training with ships at least annually

# The purpose of emergency plans

Emergency plans…

- establish measures for emergencies
- assist to control the situation
- organize the communication
- ensure that nothig is forgotten
- prepare ship commands for emergencies
- are basis for a drill
- preserve the experience made
- inform crew and staff about changes
- are basis for further improvement

# Contents of an emergency plan

- Different emergency situations
- Immediate actions
- responsibilities
- Measures to regain control
- Interfaces
- Communication
- Request of external assistance
- Taking records
- Press and externals
- Training

## Non-conformities and accidents

### Non-conformities, accidents, incidents, near misses

- Reporting to shore based company
- Investigation
- Analysis of causes
- Corrective and preventive measures

**9 REPORTS AND ANALYSIS OF NON-CONFORMITIES, ACCIDENTS AND HAZARDOUS OCCURRENCES**

**9.1** The SMS should include procedures ensuring that non-conformities, accidents and hazardous situations are reported to the Company, investigated and analysed with the objective of improving safety and pollution prevention.

**9.2** The Company should establish procedures for the implementation of corrective action, including measures intended to prevent recurrence.

☑ ashore
☑ on board

- Establish a procedure for the workflow and communication
- Provide tools for implementation (e.g. forms, software)

**What incidents are possible?**

**What near misses are possible?**

**What non-conformities are possible?**

# Examples for accidents and incidents

## What incidents are possible?

- Technical failures (propulsion, steering, electricity etc.)
- Loss of anchor, rudder, propeller
- Occupational accidents
- All kind of emergencies
- Loss of cargo
- Oil or cargo spill
- Breaking of mooring line
- Drifting from anchorage
- Reasons for calling a port of distress
- Running out of fuel
- Navigational error
- Insufficient gas feeing of tanks
- etc.

# Examples for near misses

## What near misses are possible?

- Near-collision (last-minute manoeuvre)
- Engine emergency operations (emergency stop)
- Use of emergency anchor
- Occupational near-accident (fall without injury)
- Near-grounding
  (squat, echosounder alarm)
- Failure of safety equipment
- Expired safety equipment tests
- etc.

# Examples for non-conformities

## What non-conformities are possible?

- Violation of rest hour regulations
- Violation of MARPOL regulations
  (e.g. garbage disposal at sea)
- Expired certificates of the vessel
- Missing qualification records of crew
- Expired maintenance interval
- Not performed safety drill
- Deficient vocational abilities, communication problems
- etc.

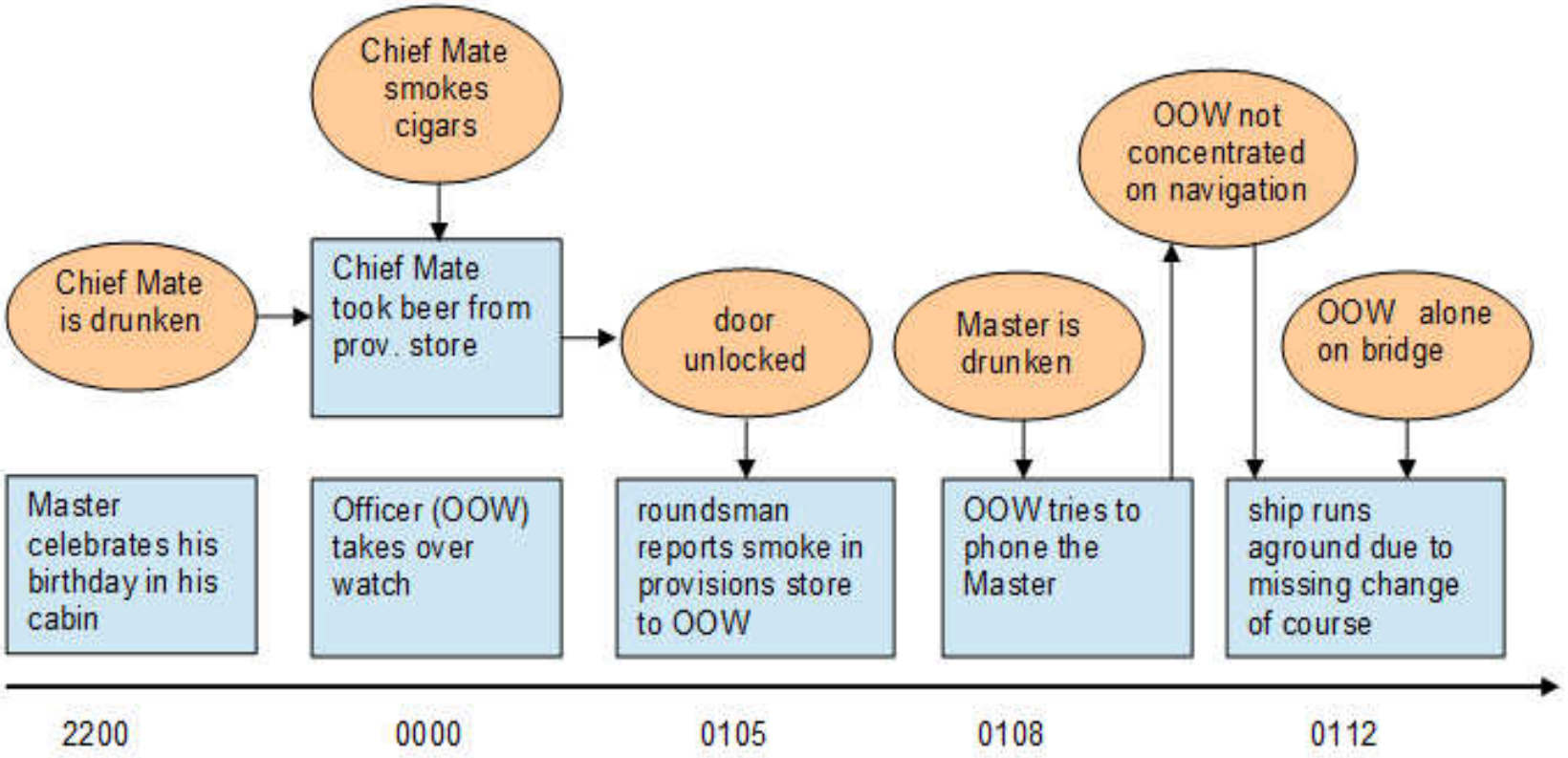
# Incident investigation

- Systematic approach
- Planning of the investigation
- Collection of evidences (hard and soft facts), e.g.
  - data (VDR, Radar, AIS, VHF...)
  - photographs and videos
  - surveys
  - Reports of people involved and witnesses
- Establishing of events on a time line
- Analysis of conditions of the events
- Identification of main contributing factors
- Assessment of the effectivity of existing barriers
- Conclusion
- Recommendation

**Root Cause Analysis**

# Time Line

Sample



## Maintenance

- **Planned maintenance**
  - Identification of equipment to be maintained
  - Identification of legal and makers‘ requirements
  - Inspection in adequate intervals
  - Reporting of non-conformities
  - Corrective measures
  - Records

- **Critical equipment**
  - Indetification of critical equipment
  - Inspection and maintenance by qualified crew and externals
  - Adherence of deadlines and intervals
  - Use of OEM spare parts or parts receommended by manufacturer
  - Regular testing of stand-by equipment

# ISM Element 10

**10 MAINTENANCE OF THE SHIP AND EQUIPMENT**

**10.1** The Company should establish procedures to ensure that the ship is maintained in conformity with the provisions of the relevant rules and regulations and with any additional requirements which may be established by the Company.

**10.2** In meeting these requirements the Company should ensure that:

**.1** inspections are held at appropriate intervals;

**.2** any non-conformity is reported with its possible cause, if known;

**.3** appropriate corrective action is taken; and

**.4** records of these activities are maintained.

☐ ashore
☑ on board

- Identify euqipment to be maintained
- Identify measures and intervals of supervision and measures
- Establish procedure for planned maintenance
- Provide tools (e.g. forms, software)

# Critical equipment

**10.3** The Company should identify equipment and technical systems, the sudden operational failure of which may result in hazardous situations. The SMS should provide for specific measures aimed at promoting the reliability of such equipment or systems. These measures should include the regular testing of stand-by arrangements and equipment or technical systems that are not in continuous use.

**10.4** The inspection mentioned in 10.2 as well as the measures referred to in 10.3 should be integrated in the ship's operational maintenance routine.

☐ ashore
☑ on board

# Examples for critical equipment

## Where sudden failure may lead to emergency

- Propulsion system
- Steering system
- Power generation and electrical system
- Navigational equipment
- Mooring equipment

## Stand-by equipment

- All redundant systems
- Safety equipment
- Alarm devices and equipment

# Monitoring of intervals

- Use of suitable software
- Establish responsibilities
- Continuous monitoring of running hours of machinery
- Pre-planning of work
- Conduction of work
- Having spare parts on stock

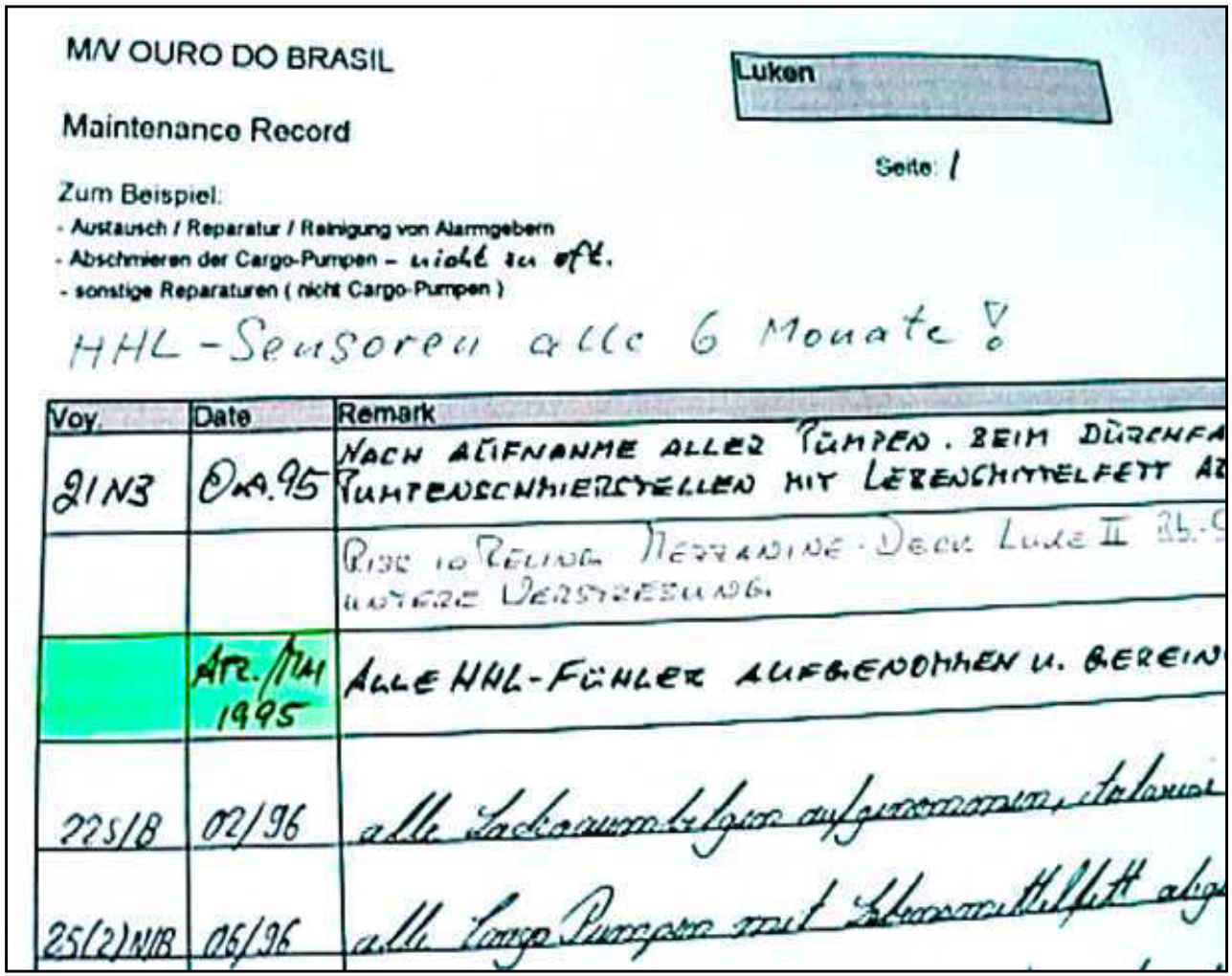
# Conduction of maintenance work

- Work according to makers' manuals
- Use of appropriate spare parts
- Use of suitable tools
- Supervision by licensed engineer or officer
- Assessment of the condition
- Reporting of non-conformities
  ( ➔ Element 9)
- Removing of their causes
- Recording work done
- Adaption of intervals as required
- Crew training

# Records

Controlled documents...

- Data sheet
- Checklists
- Log books
- Work records
- Reports



M/V OURO DO BRASIL

Luken

Maintenance Record

Seite: 1

Zum Beispiel:
- Austausch / Reparatur / Reinigung von Alarmgebern
- Abschmieren der Cargo-Pumpen – nicht zu oft.
- sonstige Reparaturen ( nicht Cargo-Pumpen )

HHL-Sensoren alle 6 Monate

| Voy. | Date | Remark |
|---|---|---|
| 21N3 | 04.95 | NACH ALIFNAHME ALLER PUMPEN. BEIM DURCHFA PUMPENSCHMIERSTELLEN MIT LEBENSMITTELFETT AU |
| | | RISE TO RELING MEERWASSER - DECK LUKE II 25.-9 WEITERE VERSTREUNG. |
| | APR./MAI 1995 | ALLE HHL-FÜHLER AUFGENOMMEN U. BEREIN |
| 22S/B | 02/96 | alle Lademaschinen aufgenommen, stationi |
| 25(2)N/B | 05/96 | alle Cargo Pumpen mit Schmiermittel abge |

# Use of computers for maintenance

## Application:

- Planning of maintenance
- Monitoring of intervals
- Documenting of measures
- Reporting of non-conformities
- Stock-keeping of spare parts

## Advantages:

- Structurized requirements
- Automatical monitoring of deadlines
- Quick access to data
- Automated analysis of measures (KPIs)

# Reliability promotion of critical equipment

- Identified and marked in maintenance plan
- Shorter inspection intervals
- Measures conducted by skilled crew
- Monitoring by licensed engineers or officers
- Work according to makers‘ manuals
- Use of OEM spare parts or parts recommended by the manufacturer
- Alternating use of redundant equipment

## Document control

- Control of documents and data
  - Validity of documents
  - Availability at relevant workplaces
  - Verification and authorization of amendments
    (➔ management of change)
  - Disposal of obsolte documents
- Safety Management Manual
  - in most effective form
  - All necessary documents on board

## 11 DOCUMENTATION

**11.1** The Company should establish and maintain procedures to control all documents and data which are relevant to the SMS.

☑ ashore
☑ on board

# Distribution and up-dating of documents

**11.2** The Company should ensure that:

**.1** valid documents are available at all relevant locations;

**.2** changes to documents are reviewed and approved by authorized personnel; and

**.3** obsolete documents are promptly removed.

☑ ashore
☑ on board

# Safety Management Manual

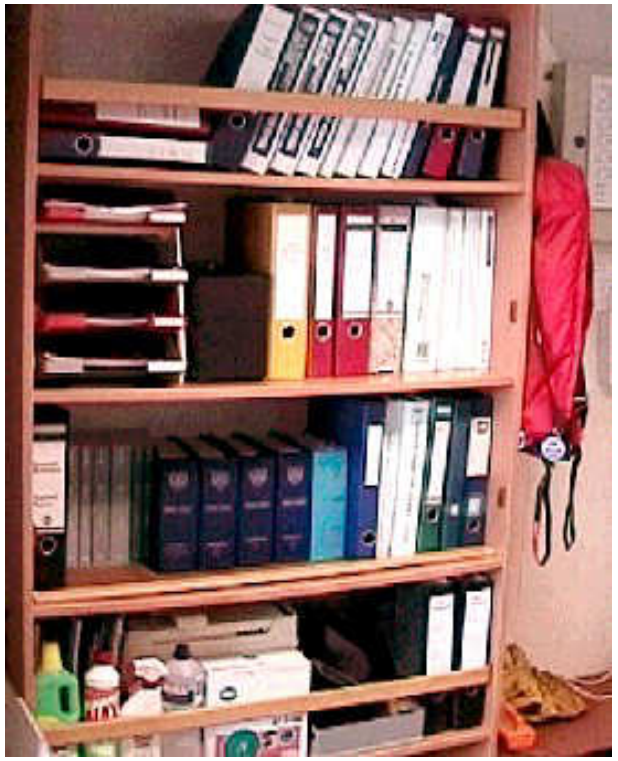
**11.3** The documents used to describe and implement the SMS may be referred to as the Safety Management Manual". Documentation should be kept in a form that the Company considers most effective. Each ship should carry on board all documentation relevant to that ship.

☑ ashore
☑ on board

# Documents

## System related documents

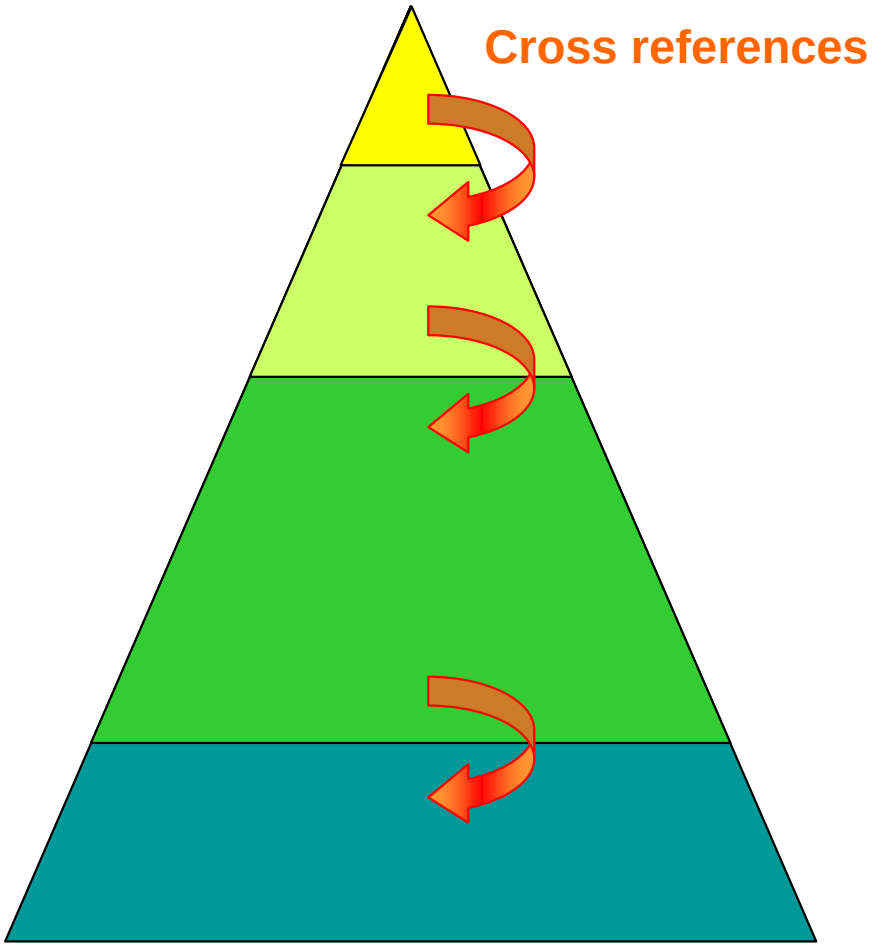
- Safety Management Manual
- Procedures and instructions
- Job descriptions
- Checklists, forms



- **External documents**
- Ship’s certificats
- Manuals, drawings
- Software and data
- Sea charts, nautical publications
- Legislation (e.g. SOLAS, MARPOL, STCW, MLC…)

# Structure of the documentation

- Safety Management Manual
- Procedures
- Emergency Plans
- Work instructions, SOPs
- Master‘s standing orders
- Organizational charts, job descriptions
- Forms, checklists, data

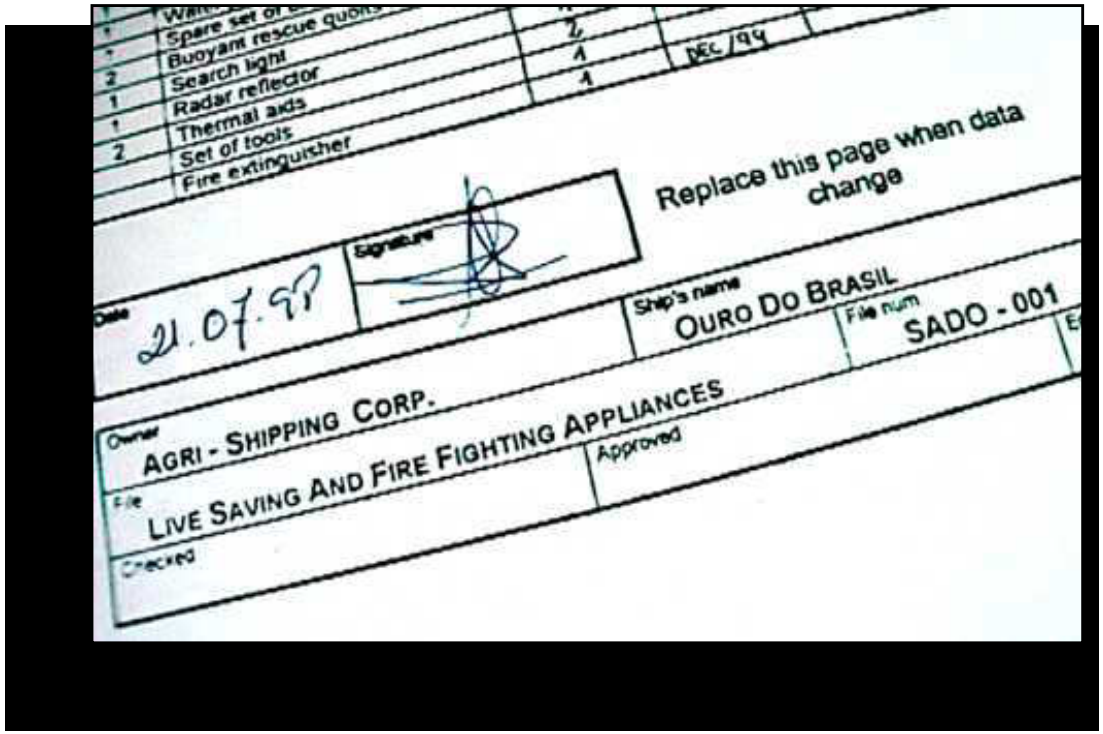


# Document control

- Establish distribution list
- Establish responsibility for up-dating ("process owner")
- Establish procedure for document amendment
- Record changes
- Inform crew and staff affected

- Mark changed parts of documents
- Remove obsolete documents
- Archive documents

# How to control a document?




- Unique title
- Document number
- Revision number
- Date
- Signature
- Authorization
- Page number and number of total pages
- Responsible person
- Distribution
- Validity (if required)

# Layout for documents

Sample

## Header

| | | |
|---|---|---|
| ***LOGO*** | **Procedure**<br>Navigation at reduced visibility | Document DP-07-13<br>page 2 of 4 |

| | | |
|---|---|---|
| Date: 16.05.13<br>Revision: 2 | Issued: Peter Miller | Authorized:<br>H. Schmidt (D.P.) |

## Footer

# Control of data

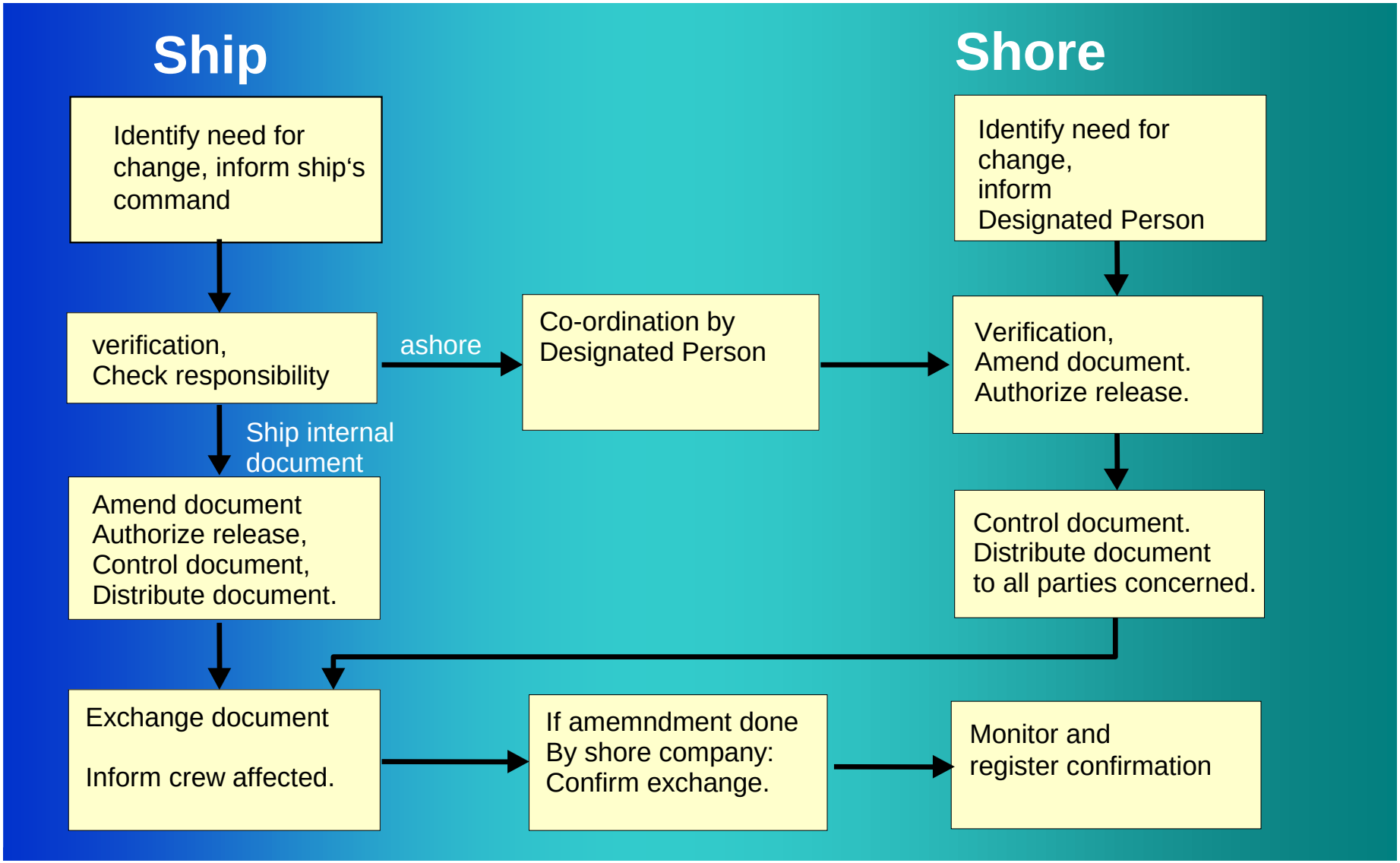
**For exampe data…**


- in computers
- in networks
- in controllers of machinery
- in GPS equipment
- in GMDSS equipment
- in ECDIS equipment
- in VDR
- in loading and stability computers
- in alarm systems
- in E-Mail systems
- in Planned maintenance system
- in Rest hours software

# How to control data?

- Identify data and software
- Establish user rights
- Establish rights to change data
- Define release to be used
- Organize data back-up
- Have current virus protection
- Secure access to computers and servers (firewall)
- Maintain the network

# Amendment workflow



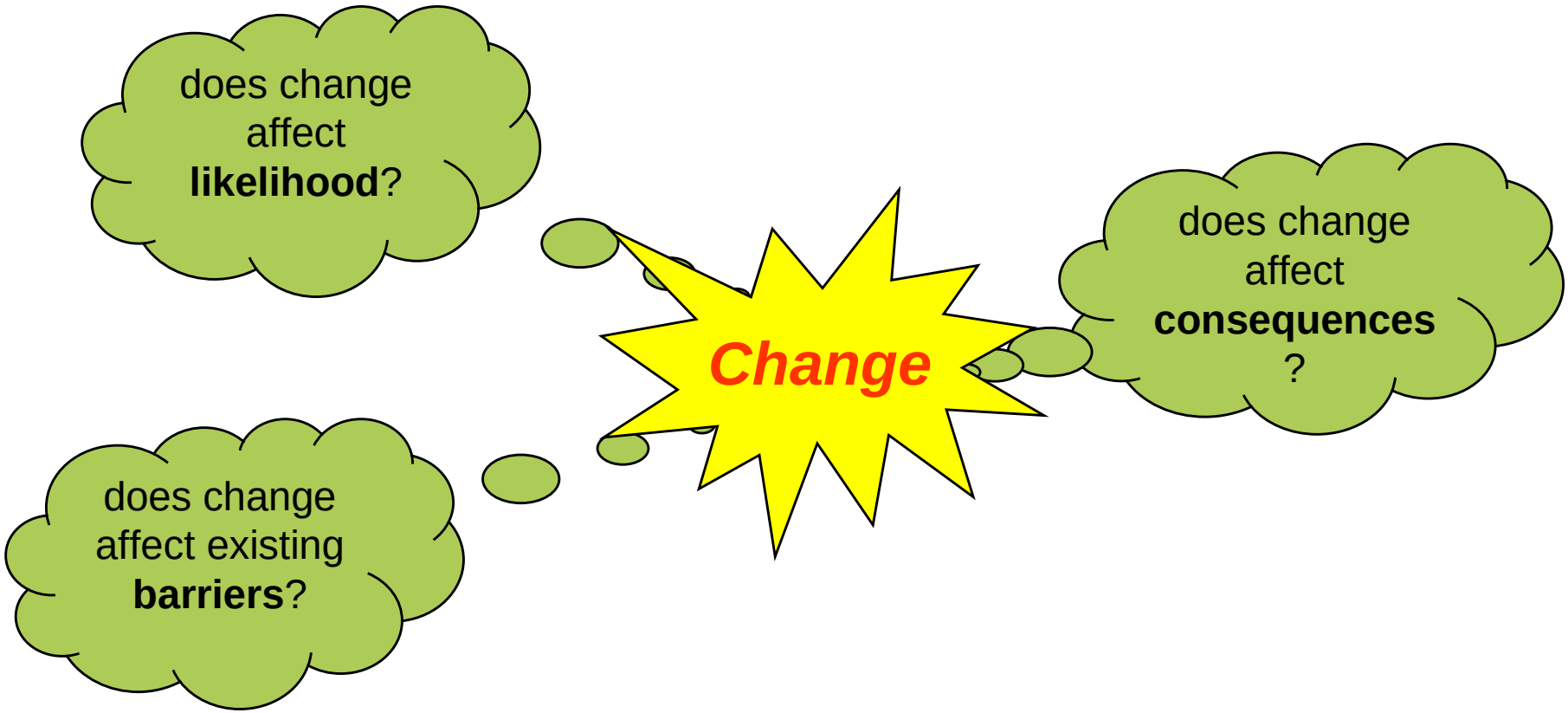
# Change Management

- Uncontrolled changes may result in accidents
- Changes should be managed
- Risk assessment
- Planning of measures
- Provision of resources
- Training of personnel involved
- Amendment of documentation
- Authorization of change
- Supervision of change activities
- Assessment and review

# For which changes a management of change should be applied?

# Identification of implications of change

- implications to the existing system
- interrelation to other changes



# What changes do exist?

| | |
|---|---|
| **Structure** | • company merger<br>• company reorganization |
| **Personnel** | • crew change or change of staff ashore<br>• change of crew manager or origin of crew |
| **Organization** | • change of responsibilities and/or authority<br>• change or modification of processes |
| **Technology** | • new vessel or type of vessels in the fleet<br>• change of technical systems, appliances, tools<br>• exchange of spare parts |
| **Operations** | • change of vessel's trade or charterer<br>• change of operational settings |

## System review

- System evaluation by internal audits
  - Independent auditor
  - Information on audit result
  - Timely corrective actions

- Regular review of the system

# Internal Audits

**12 COMPANY VERIFICATION, REVIEW AND EVALUATION**

**12.1** The Company should carry out internal safety audits on board and ashore at intervals not exceeding twelve months to verify whether safety and pollution-prevention activities comply with the safety management system. In exceptional circumstances, this interval may be exceeded by not more than three months.

☑ ashore
☑ on board

- Internal audits
- Verification of compliance
- Frequency < 12 months

# Audit procedure

**12.3** The audits and possible corrective actions should be carried out in accordance with documented procedures.

☑ ashore
☑ on board

# Internal auditors

**12.4** Personnel carrying out audits should be independent of the areas being audited unless this is impracticable due to the size and the nature of the Company.

☑ ashore
☑ on board

- The auditor must not be from department being audited
- A superintendent should not audit „his“ vessel
- A Master should not audit his vessel, in general.
- A Master may audit before taking over command.
- Exemptions apply for small companies only.

# Information on audit results

**12.5** The results of the audits and reviews should be brought to the attention of all personnel having responsibility in the area involved.

☑ ashore
☑ on board

- Closing meeting with Master/department head
- Signature of the master/department head on the audit report
- Copy of audit report on board

# Corrective actions

**12.6** The management personnel responsible for the area involved should take timely corrective action on deficiencies found.

☑ ashore
☑ on board

- Master/department head is responsible
- Timely corrective action, i.e. without undue delay

Timely = before an accident is likely to happen again

# Objectives of internal audits

- Assessment of the effectiveness of the system
- Evaluation of compliance with legal requirements and company procedures
- Identification of sources of errors and risks
- Identification of need for actions
- Indetification of chances for improvement
- Listening to crew and staff

# System review

## Ship

**5 MASTER'S RESPONSIBILITY AND AUTHORITY**

**5.1** The Company should clearly define and document the masters responsibility with regard to: **…**

**.5** periodically reviewing the SMS and reporting its deficiencies to the shore-based management.

## Shore

**12.2** The Company should periodically evaluate the effectiveness of the SMS in accordance with procedures established by the Company.

- Conduct reviews at regular intervals (min. anually)
- Co-ordinate reviews by Masters and by Designated Person
- Evaluate effectiveness of the system
- Identify need for improvement


Synergies with other management disciplines
Louis Vest

# Maritime management systems

| Standard | Subject | Objectives |
|---|---|---|
| ISM Code | Safety, Environmental protection | Accident prevention |
| ISO 9001 | Quality | Customer‘s satisfaction |
| ISO 14001 | Environmental protection | Reduction of impact to environment |
| OHSAS 18001 | Occupational safety and health | Accident prevention |
| ISO 50001 | Energy | Improvement of energy efficiency |

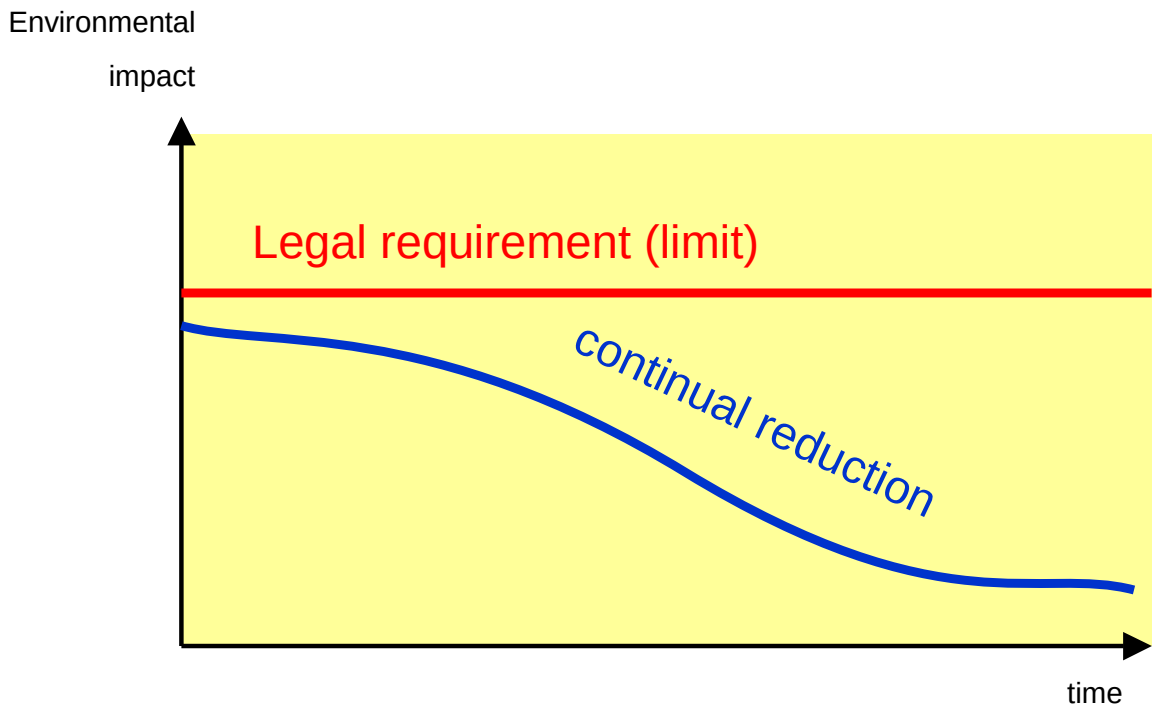
Standards for performance monitoring

- TMSA Tanker Management Self Assessment
- SIRE Ship Inspection Report Programme

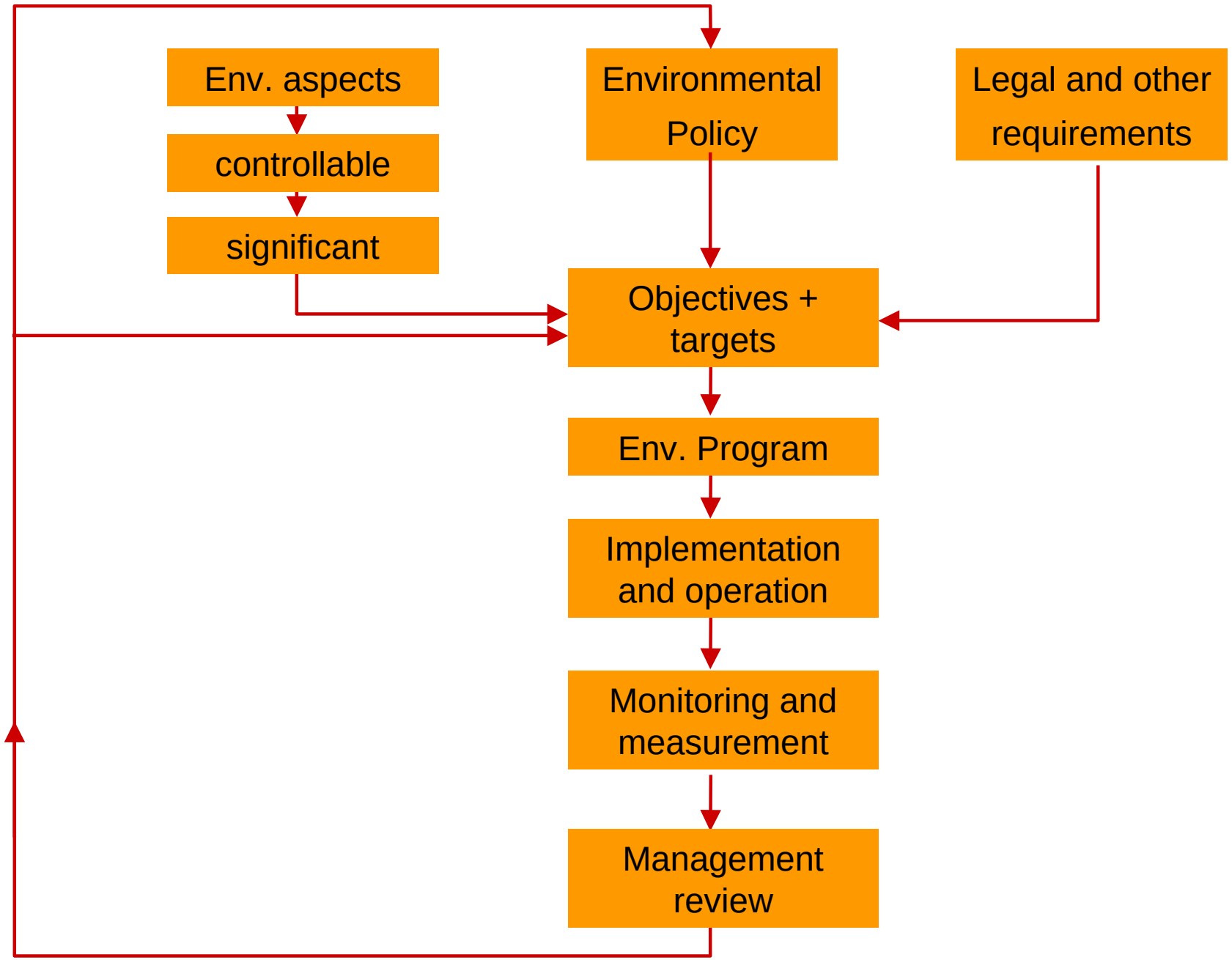
# Environmental management (ISO 14001)

**Legal compliance**

**Continual improvement**



# Elements of ISO 14001

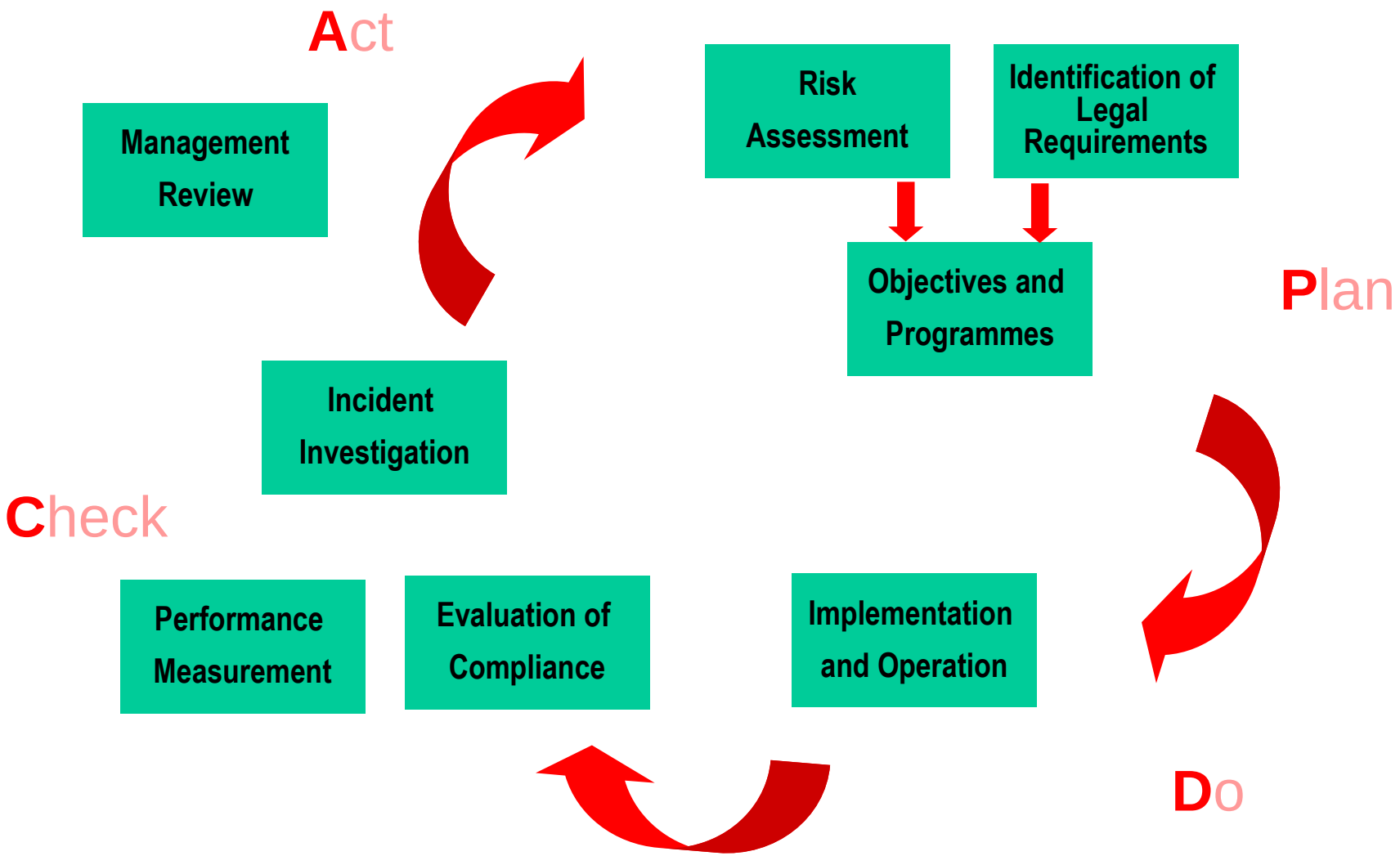


# Current environmental topics

- Ballast water
- Fouling maintenance (USCG)
- Energy efficiency
- Sulfur content in fuel
- NOx emissions
- Antifouling paint
- Garbage management
- Sewage water treatment
- Asbestos
- Ship recycling

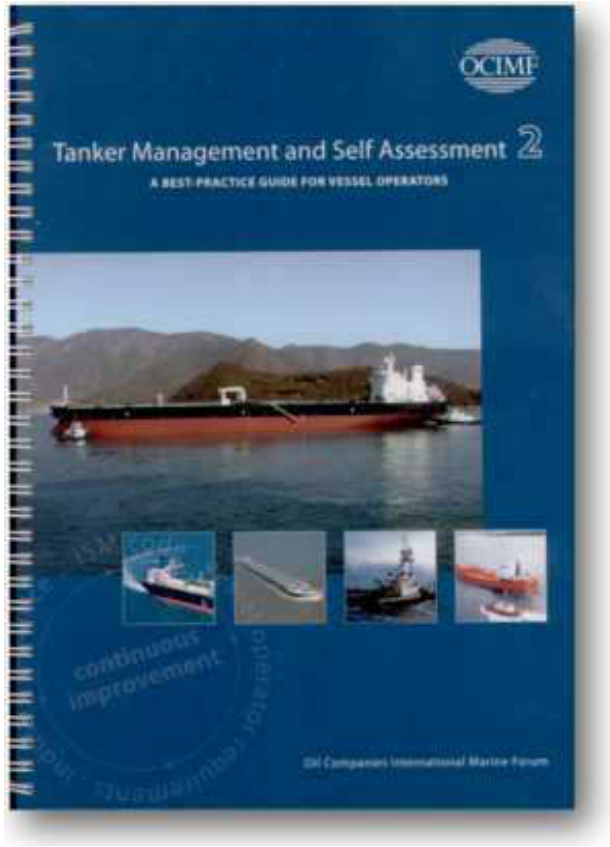
# Quality management (ISO 9001)

# Structure of an OH&S System according to OHSAS 18001



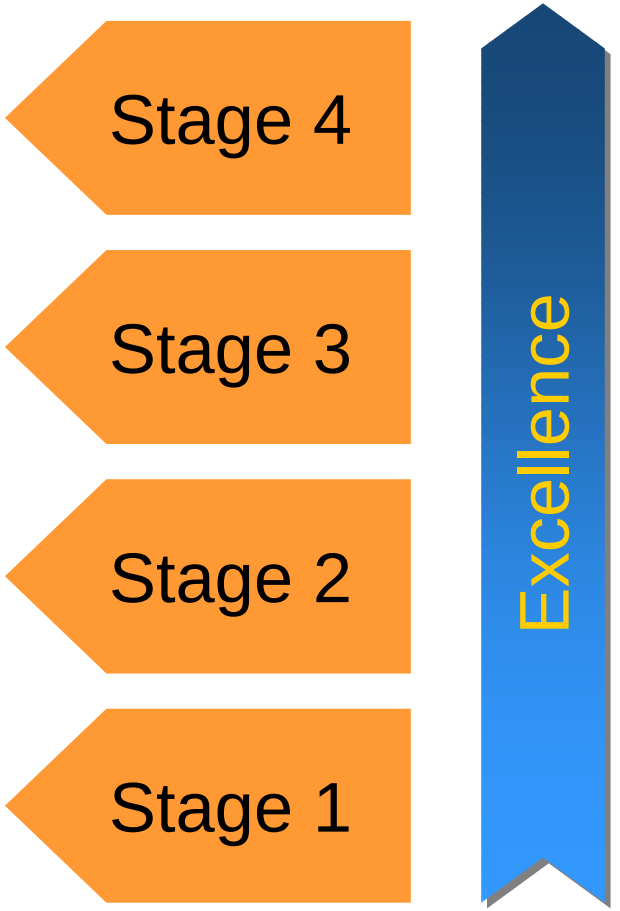
# TMSA

| | |
|---|---|
| Publisher: | OCIMF<br>Oil Companies International<br>Marine Forum |
| Standard: | TMSA<br>*Tanker Management and*<br>*Self Assessment*<br>1st edition: 2004<br>**2nd edition: 2008** |
| Objectives: | Evidence of a level of quality, safety and environmental protection |

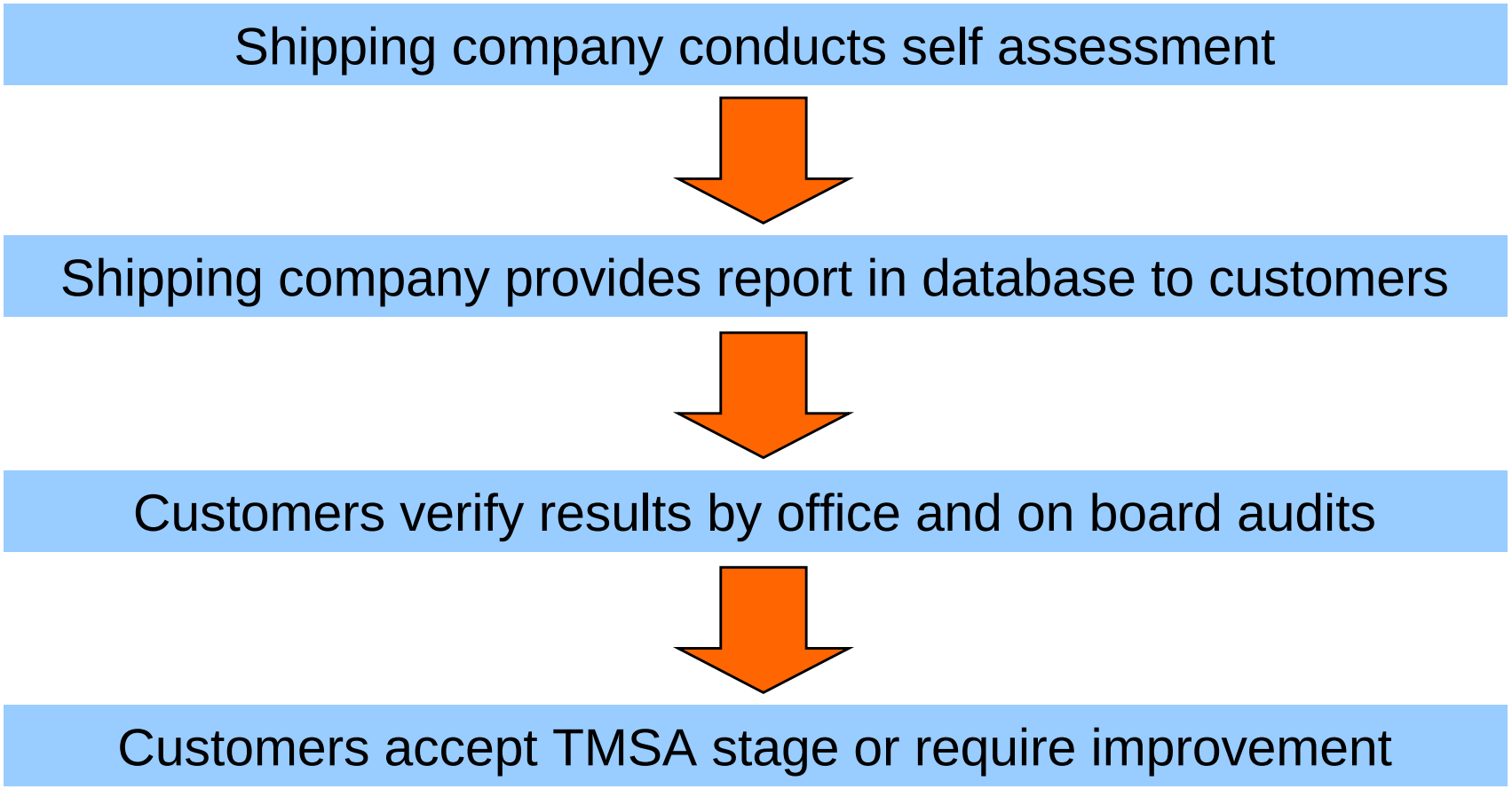


# TMSA

| | |
|---|---|
| 1 | Management, Leadership and Accountability |
| 2 | Recruitment and Management of Shore-Based Personnel |
| 3 | Recruitment and Management of Ship Personnel |
| 4 | Reliability and Maintenance Standards |
| 5 | Navigational Safety |
| 6 | Cargo, Ballast and Mooring Operations |
| 7 | Management of Change |
| 8 | Incident Investigation and Analysis |
| 9 | Safety Management (Shipboard / Shore-Based) |
| 10 | Environmental Management |
| 11 | Emergency Preparedness and Contingency Planning |
| 12 | Measurement, Analysis and Improvement |

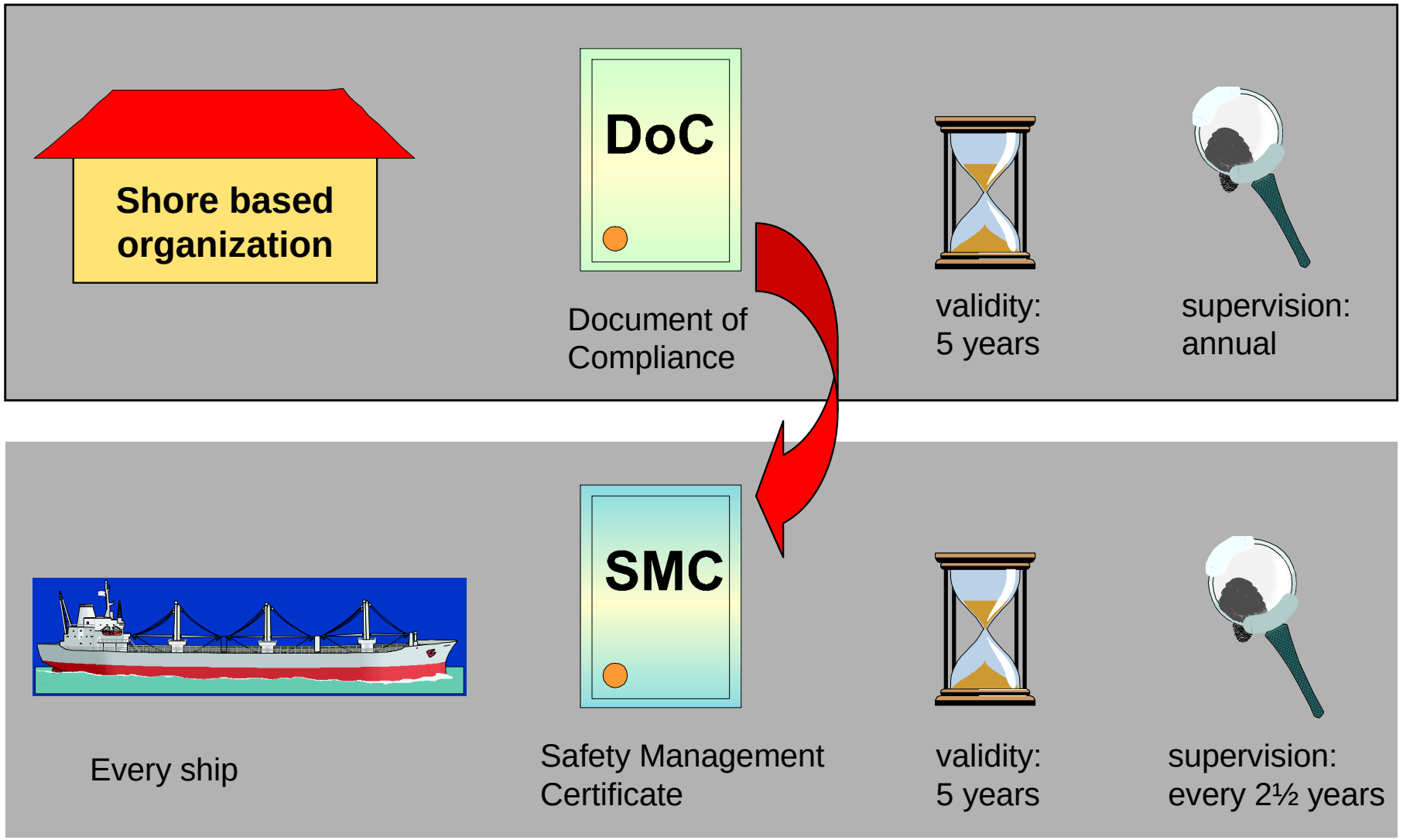


# TMSA procedure




Certification and
Enforcement
Louis Vest

# Certificates according to SOLAS IX



# Certification Deadlines


- Passenger Ships and High Speed Passenger Crafts of every size
- Oil and Chemical Tankers
- Gas Carrier
- Bulk Carrier
- High Speed Cargo Vessels

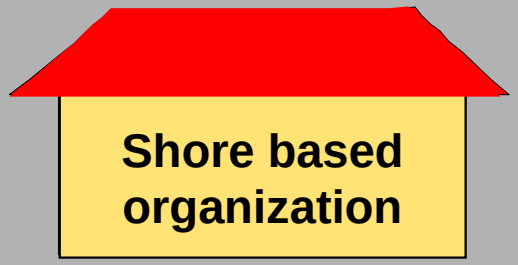
500 GRT and more

- All other Freight Vessels Mobile Drilling Units

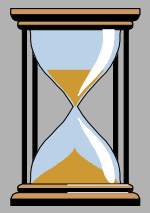
500 GRT and more

# Interim Certificates

## Interim DoC

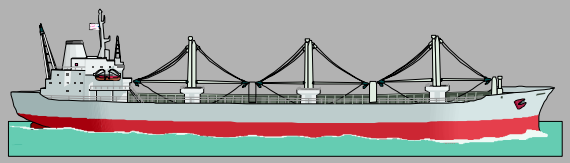



- New company
- New ship‘s type in the company



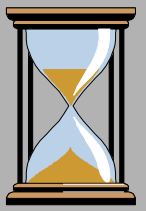
validity:
12 months

## Interim SMC



for an individual vessel

- Newbuilding
- Change of owner
- Change of ship manager
- Change of flag



validity:
6 months

# Certification process

## Company

- Establish and implement SMS
- Decide for certification body
- Apply for certification and submit documentation

- Amend documents if required
- Conduct internal audits
- Conduct management review

- Corrective action if required

- Send copy of DoC on board

- Corrective action if required

**min. 3 months**

## Flag State, Certification body

- Documentation review

- Audit of shorebased company
- Issue DoC

**DoC**

- Audit of the vessel

- Issue SMC

**SMC**

# Combined ISM-ISO Audits

- Combination of ISO 9001:2008 and/or ISO 14001:2004 with ISM
- Combined audit procedure
- Less audits
- Reduced costs

**Fleet up to 12 ships**

All ships of the fleet to be audited as per ISM scheme,
i.e. every 2.5 years

**Fleet with 13 ships and more**

Sample of the fleet to be audited annually:

| | |
|---|---|
| Initial audit | $\sqrt{n}$ |
| Follow-up audit | $\sqrt{n} \times 0,6$ |
| Renewal audit | $\sqrt{n} \times 0,8$ |

Complete number of audits within three years

# Monitoring of safety

Flag State

Owner, ship manager

Customers (vetting, TMSA)

Port State

# Port State Control

**Objectives:**

- Improvement of safety and environmental protection
- Sub standard ships shall not have any chance

**Way:**

- Systematic supervision of all ships in the ports
- Supervision of the compliance with all rules and regulations
- Verification of corrective actions
- Arresting or banning of unsafe vessels

# ISM - a story of success?

# Summary

- Maritime safety is aimed on prevention of accidents
- ISM is a risk based management system
- It assists companies complying with requirements
- Proper planning avoids incidents
- Documentation guides crew and staffs
- Records demonstrate compliance
- Qualification and awareness are important elements
- The company learns from errors, incidents, accidents and improves prevention


The End
Thank you for attention
Photographs by
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